TEXAS HIGHWAY DEPARTMENT

Construction & Maintenance

BULLETIN No. 3
Nov, 1950

TURNOUT
FOR VIEWING
"EL CAPITAN" AND "GUADALUPE PEAK"

Foreword

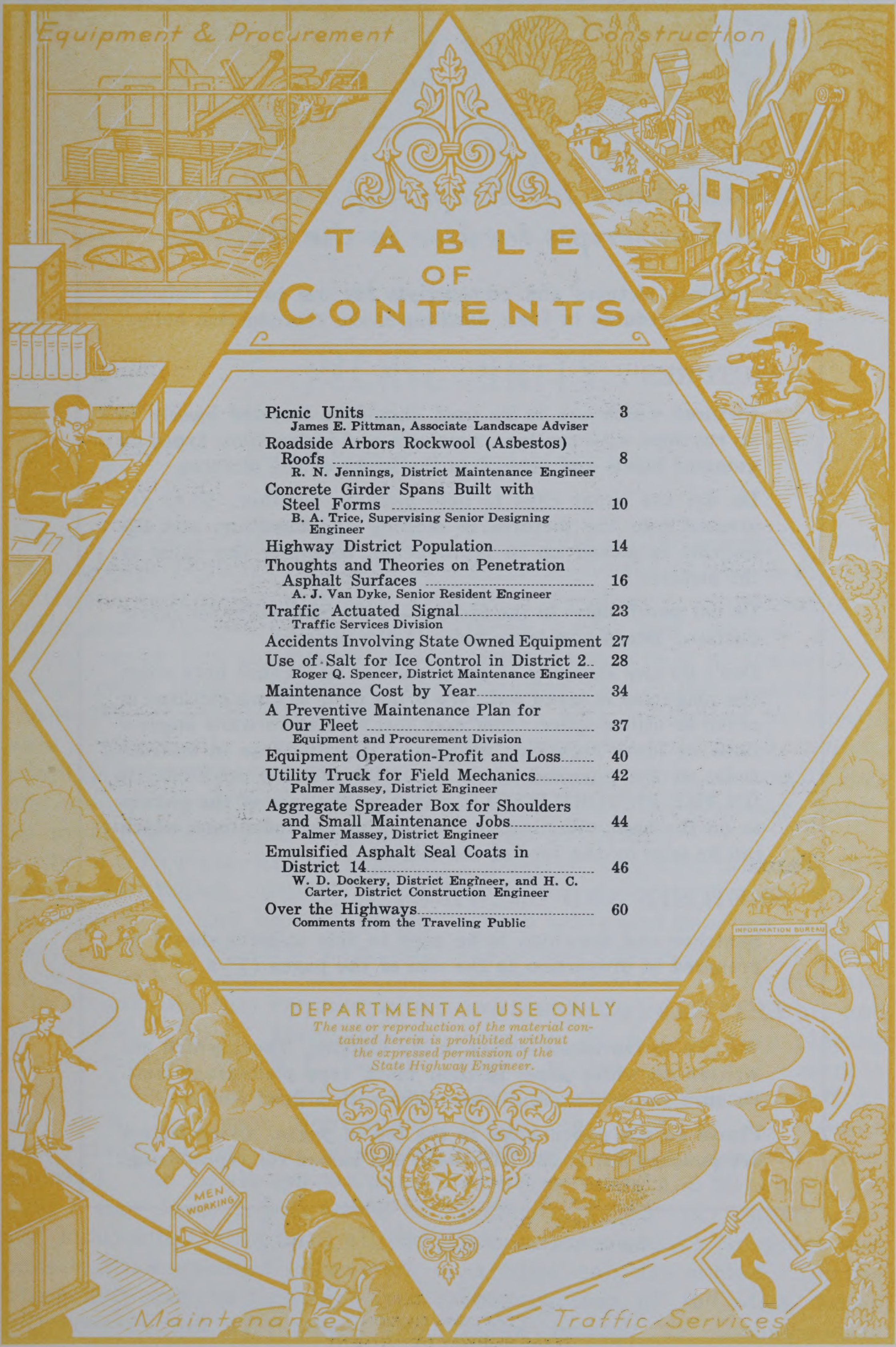
This bulletin is published for the purpose of presenting practical information applicable to current highway problems. These conclusions and data are not necessarily endorsed by the Highway Department nor are they to be construed as instructions. Employees are invited and urged to submit suggestions and relate experiences which would benefit those engaged in the construction and maintenance of highways.

Photographic services are available and other assistance may be obtained if desired in preparing material for submission. All material and comments should be directed to the Chief Engineer, Construction & Maintenance, Austin, Texas.

Published Jointly by

Maintenance Division	**D- 3**
Equipment & Procurement Division	**D- 4**
Construction Division	**D- 6**
Traffic Services Division	**D-16**

REPRODUCED BY
OPERATIONS DIVISION
TEXAS HIGHWAY DEPARTMENT
AUSTIN,TEXAS



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Instructions for Preparing Pictures and Manuscripts for Use in the Bulletin

In sending pictures and manuscripts for use in this bulletin, certain procedures in their handling make reproduction better.

PICTURES . . .

Pictures which are to be used should be inclosed loosely in an envelope with captions, numbers, and instructions typed on gummed labels and applied to the backs of the pictures.

Do not use paper clips to hold pictures together. They are pressed into the pictures in mailing and handling, and the imprint is picked up in reproducing, lessening the value of the picture.

Do not punch holes in the pictures. This ruins them for reproduction. Brads also leave holes in the pictures.

Don't do any cropping of pictures. Let us do that here when the magazine is layed out. We often need to crop pictures in order to utilize space. You may feel free to forward suggestions or ideas regarding cropping. Include these in instructions on the gummed label. DO NOT WRITE ANYTHING ON THE PICTURE ITSELF, either on the face of the picture or on the back. Writing on the back makes indentions which can be seen on the face of the picture.

SKETCHES AND DRAWINGS . . .

Sketches and drawings to be used in this bulletin should be prepared in proportion to the size of the pages (7" x 10").

LETTERS . . .

We like to reproduce letters in the bulletin. Those which are written on white paper in clear black type photograph best. Be sure you use a clean typewriter with a good ribbon.

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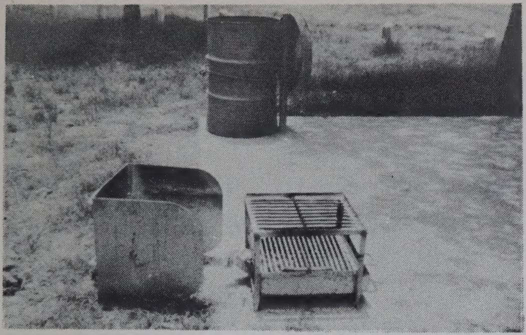


◆Fireplace with windshield and ash tray.

◆Tables and benches long way of slab.

PICNIC UNITS

JAMES E. PITTMAN, *Associate Landscape Adviser*

Early in June, 1950, Mr. S. J. Treadaway, District Engineer in Abilene, expressed a desire to build some fireplaces in the existing parks and in several proposed park sites. However, he made the stipulation that they be safe, practical, economical, adaptable for turnouts or parks, and conserving on fuel. By "safe" he meant to minimize the possibility of a fire starting in nearby grass or leaves, which might damage trees and shrubs in the park, or even spread to adjacent farm or ranch land.

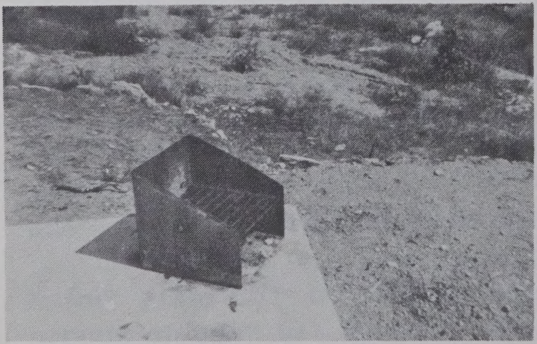
In discussing this request with Mr. E.W. Couch, Maintenance Superintendent, Mr. R.L. Daugherty, General Foreman, and Mr. O.B. Seabourn, Equipment Supervisor, a new idea was formulated. As is always the case with a new idea, it was added to and subtracted from until all the possibilities seemed exhausted. The result was the fireplace type I-C constructed with tables and benches and garbage container on a concrete slab as a complete unit. After approval of the design by Mr. Treadaway, construction of three units was started in the roadside park near Anson on U. S. Highway 83. In the meantime, a sketch was submitted to Austin for approval by D-16. Some suggestions were offered by Roy S. Rodman, Supervising Landscape Architect.

Briefly, the unit consists of a four-inch concrete slab 12' x 22', with a table and benches, a fireplace, and a garbage can. A paved width of three feet on the side and two feet on the end of the table and benches is provided by placing them on one end of the concrete slab. Garbage container and fireplace are placed at the corners on the other end of the slab. For existing table and benches, the concrete slab is constructed around them and the fireplace and garbage can are added. During construction of the slab, holes large enough to accommodate existing tree trunks are provided with allowance for future growth. These spaces are filled with coarse gravel to prevent accumulation of trash.

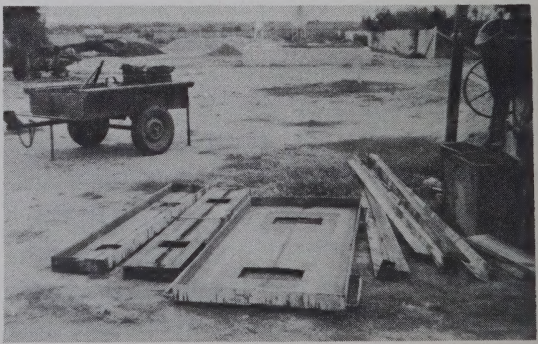
Two fireplace designs have been used which consume a small amount of fuel. The grates for these fireplaces are the same size as those in the standard designs. One inch angle iron and 3/8 inch reinforcing steel were used in constructing the firebox with its four legs embedded in the concrete slab. An ash tray and windshield were constructed of salvaged metal signs that can be fitted to any of the sides, depending upon the direction of the wind. Disadvantage of this design is that the ash tray and windshield may be removed from the park. Fireplace type I-C, which is a design welded into one complete unit, overcomes this disadvantage. It is fastened to the concrete slab with a 3/4 inch bolt so that it may be revolved in any direction. This design has proved very satisfactory.

A two-inch iron pipe thirty inches long that is set in the concrete anchors a fifty gallon drum which serves as the garbage container. Two curved pieces of steel, one of them hinged, are welded to the drum and locked around the post to prevent the container from overturning. Also, a light weight lid for the container is permanently fastened to the post with a chain. The entire unit is painted grey with the words "Trash," and "Do Not Burn," stenciled on the side of the container. It has been found that the public will use the container much better than the underground pits that have been constructed in most of the parks. However, in this area of long distances, maintenance has found that they can save time and money by emptying the containers in the underground pits when inspecting the parks.

Through Mr. Treadaway's insistence for a more serviceable fireplace, he has made a definite contribution. The idea of grouping all necessary facilities on a concrete slab in one small compact unit is another forward step for the comfort, convenience, and pleasure of the traveling public. By furnishing a more convenient and utilitarian facility, it has been observed that a dirty unit is as rare as a clean one used to be. In addition, the unit can be constructed by three or four men in a couple of days for approximately $200, which explains the hearty approval it has received from the District Engineers wherever shown.



◆Fireplace type I-C.



◆Steel forms for tables and benches.

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TEXAS HIGHWAY DEPARTMENT

STATE HIGHWAY ENGINEER
D. C. GREER

FILE NO. D-18
(JAW)

Del Rio, Texas
August 14, 1950

General

Mr. D. C. Greer
State Highway Engineer
Austin 14, Texas

Dear Sir:

There has been so much controversy regarding placing of seal coats and single bituminous pavements with bleeding as a result I thought possibly the attached pictures might prove interesting to you and also be of some significance.

The first two pictures were taken on a section of State Highway 85 in Maverick County and show a slight amount of bleeding. This was a double bituminous surface treatment, the first course of which was placed in the Fall of 1949 and the second course in July 1950. The first course had a maximum size aggregate of 3/4" while the second course had a maximum of 5/8". I am not in position to definitely state that the bleeding was caused by the small aggregate in the second course or by the fact that the first course was placed in the Fall. But in any case the results have not been too good.

The top picture on the second sheet was taken on the same section of highway and shows a seal coat placed in July of this year using special grading specifications with a maximum size stone of 3/4". This section of road carries exactly the same type and volume of traffic as the other section, and you will note that there is no evidence of bleeding whatsoever.

The bottom picture on the second sheet shows a section of the same highway between Eagle Pass and the junction with State Highway 76, and on which we placed 60# per square yard of fluxed limestone rock asphalt for the purpose of leveling up and sealing. This would be my recommended treatment for all highways if funds were available and the road was not smooth.

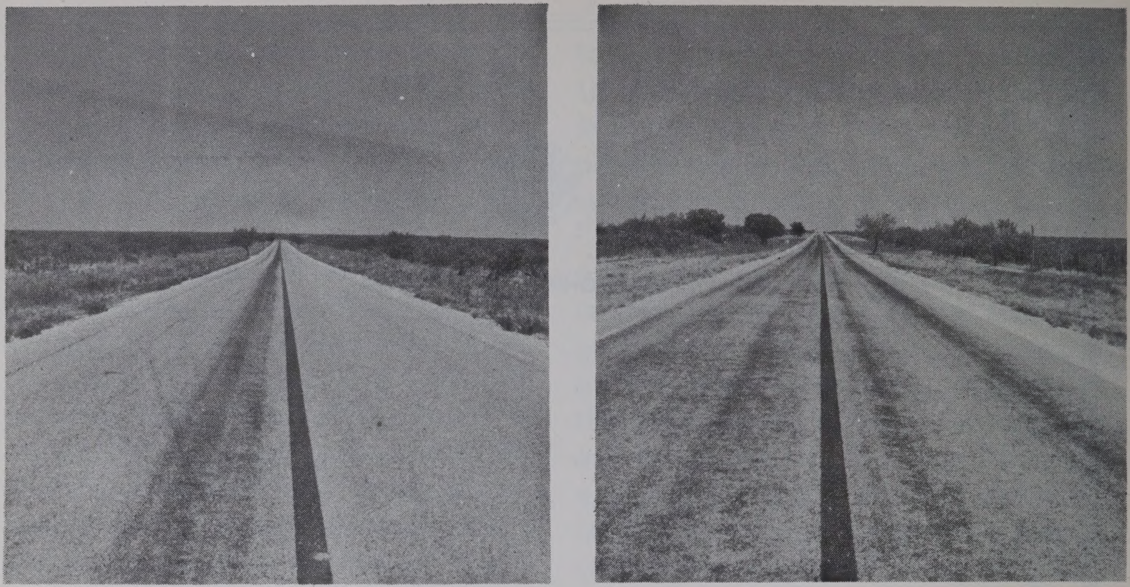
I am very sincere in the belief that good results on singles and seals can always be obtained by using the proper amount of asphalt and aggregate, the application of these materials during June, July, or August and a larger size aggregate.

Next year on some short section of seal or single I propose to use a specification permitting a maximum size stone of 1" with the proper grading down to a 10-mesh sieve and with practically no material passing the 10-mesh. This may be somewhat revolutionary in this State but is used extensively in the Southeastern States.

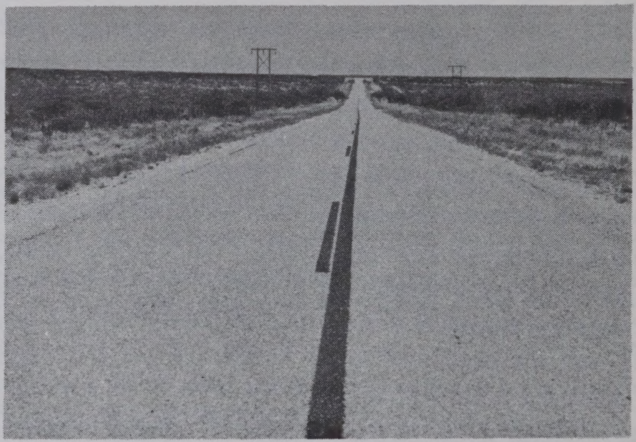
Sincerely yours,

M. B. Hodges
District Engineer

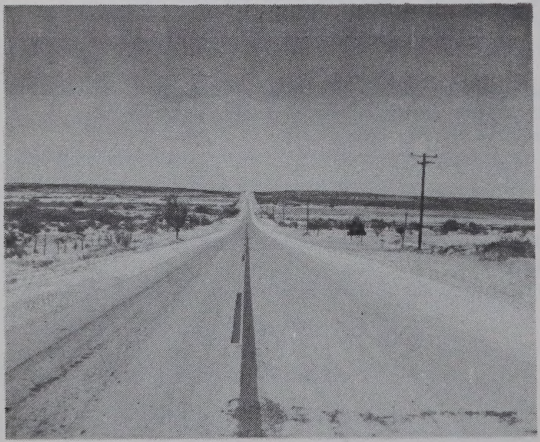
MBH/gh
Incls.



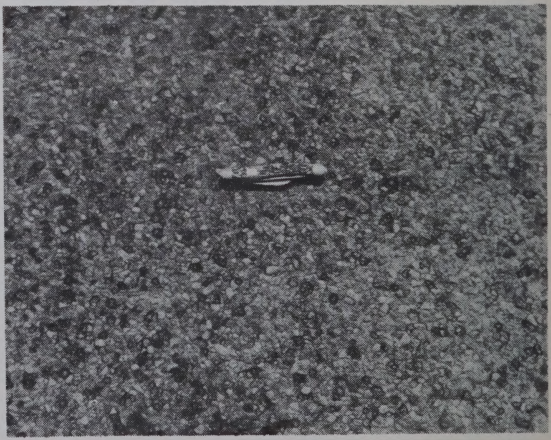
◆A section of State Highway 85 with double bituminous surface treatment showing a slight amount of bleeding.



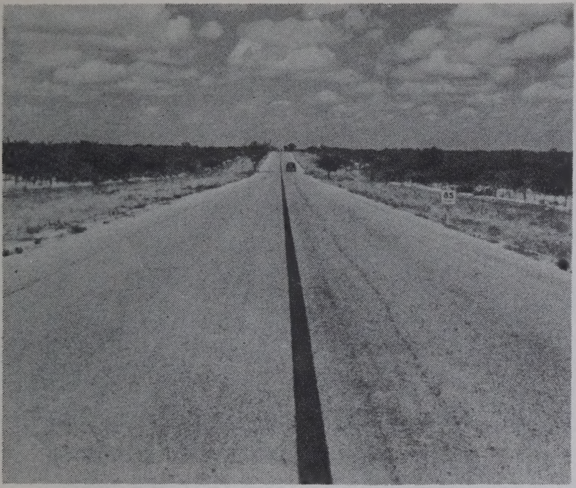
◆Same section with seal coat using special grading specifications shows no evidence of bleeding.



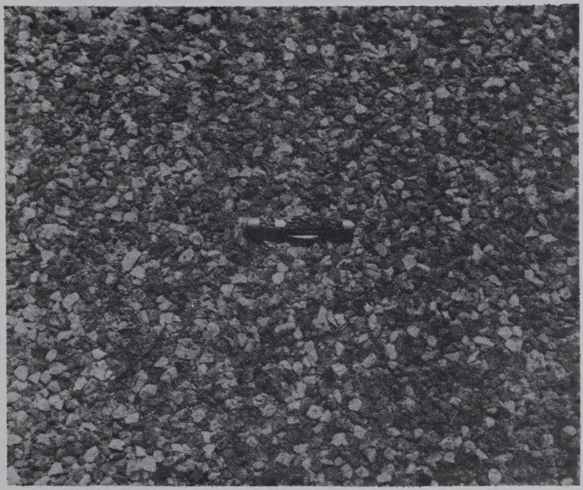
◆A section of the same highway on which 60# per square yard of fluxed limestone rock asphalt has been placed to level and seal.



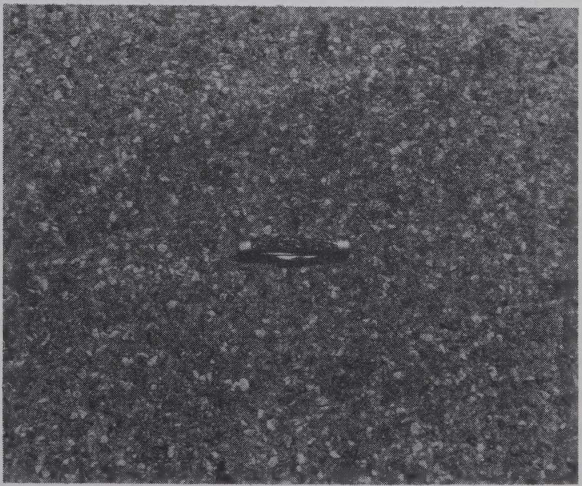
◆A closeup view showing the texture of the surface on a section placed in July 1950 and using a max. size stone of 5/8".



◆A view showing a section of the surface completed in July 1950 and using a max. size stone of 3/4".



◆A closeup view of the texture of the pavement noted in the picture above.



◆A closeup view of the texture of the surface on a section completed in November 1949 and using a max. size stone of 5/8".

ROADSIDE ARBORS ROCK WOOL (ASBESTOS) ROOFS

R. N. JENNINGS, *District Maintenance Engineer*

West Texas is notable for its lack of shade and for the distance between towns. Roadside turnouts with shade, either natural or artificial, are being established on the main highways in District 7 so that the traveler may pause and relax with some degree of comfort.

Arbors are built at these locations selected for a turnout which do not have natural shade. A framework of welded pipe and reinforcing steel, trussed to prevent sag, and covered with wire mesh supports the arbor roofing material. A sloping eave provides additional shade and gives an illusion of thickness to the roof.

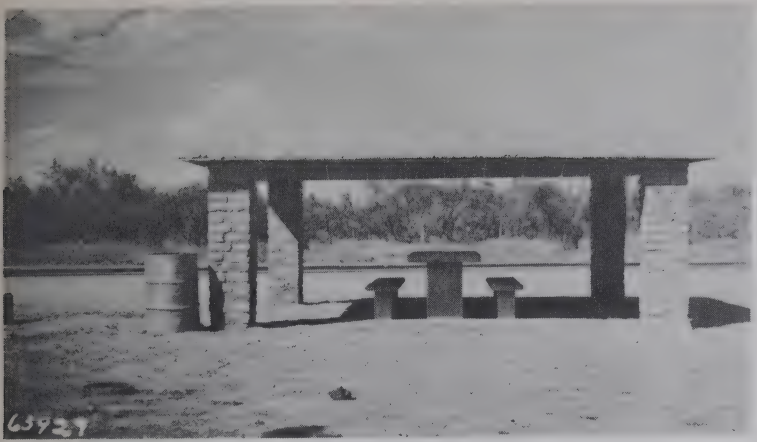
Several materials, including cedar brush, georgia cane stalks, and sacahuista grass, have been used for thatching the arbors. None were found to be satisfactory as they made fine bonfire material, were used by birds as roosts and needed replacing frequently to give a good appearance.

Rock-wool insulating material in a natural color has been tried on several arbors and has overcome the disadvantages of the other roofing materials. A type of insulating material in batts or sheets, with waterproof paper on one side is laid on the wire mesh of the arbor frame with the rock-wool side up. Chicken wire is placed over the insulating material and securely wired to the lower wire mesh. This prevents any movement of the roofing material.

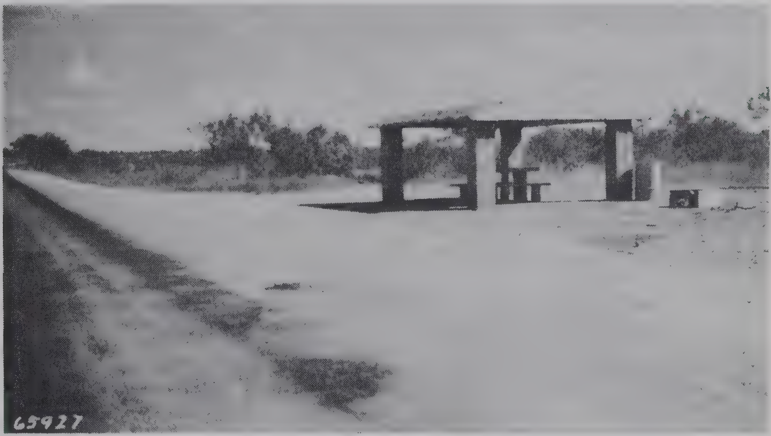
Sites of roadside facilities are carefully chosen to attract the maximum number of users and to permit cleaning with a minimum of expense. Spots near towns should be considered as this allows tourists to buy cold drinks with their food and consume them before the drinks become warm. Sites close to maintenance section or subsection headquarters permits cleaning to be done with a minimum of travel time. Spots that are being used as roadside snack places may be noted by a litter of cans, bottles, and paper. A table with shade that is provided here is likely to be patronized.

The long axis of the arbor should be placed where possible pointing to the setting sun in the middle of July. This will give the maximum amount of shade during the summer months of June, July, and August. A concrete floor, raised above the surrounding ground should be placed around the tables.

Prints of this design of arbor may be obtained from the Landscape Department.

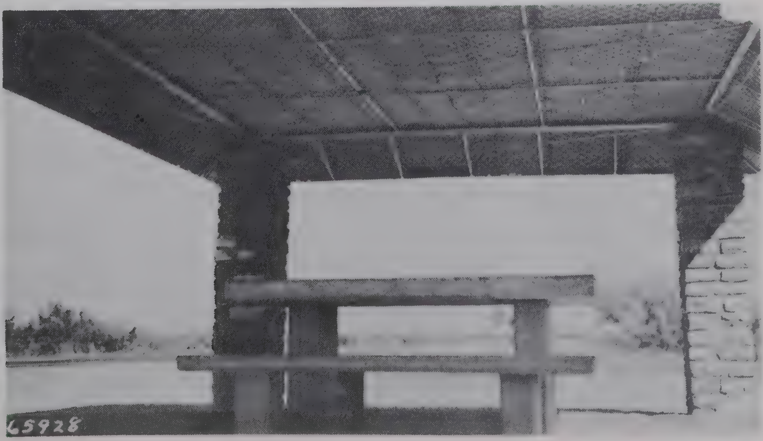


◆ Side view of arbor.

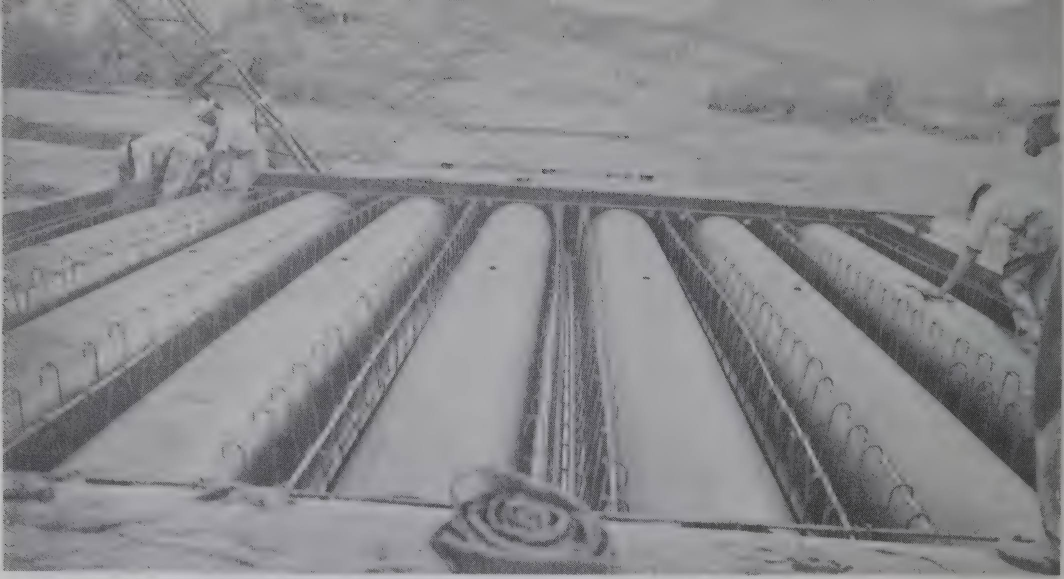


◆ Arbor with relation to road.

◆ Roadside turnout using natural shade.



◆ View of supporting framework.



◆Forms and girder steel in place. Transverse steel will be laid on top of the girder steel and one additional longitudinal bar per girder will be placed on top of the transverse steel.

CONCRETE GIRDER SPANS BUILT WITH STEEL FORMS

B. A. TRICE, *Supervising Senior Designing Engineer*

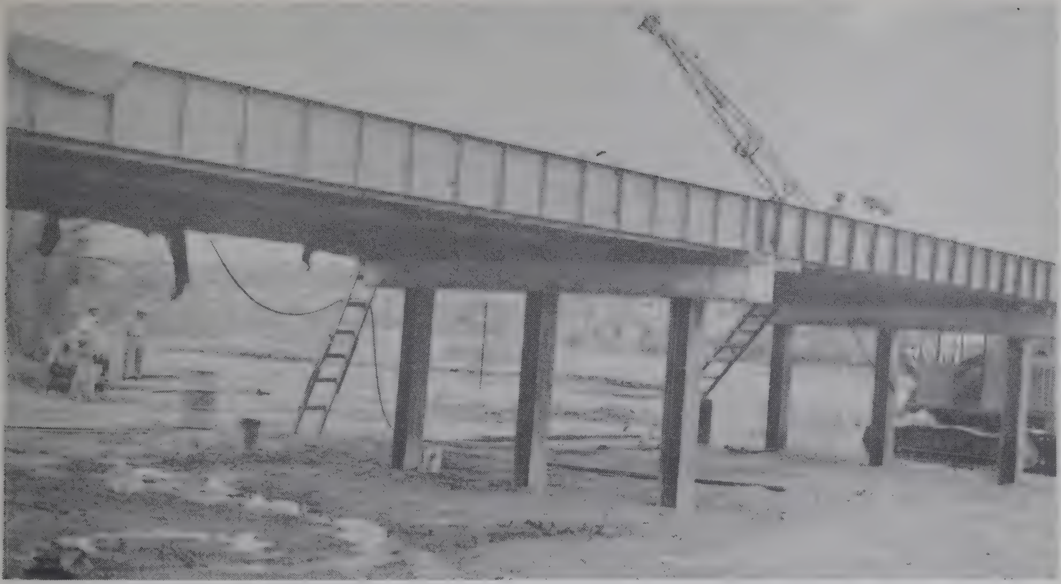
The use of steel forms in the construction of concrete girder spans has now reached the contract stage on three projects. One of these projects, in Presidio County, is under construction.

This idea was originally conceived by the Bridge Division in 1947, and standard plans were recently issued and designated as CG-10, CG-15, and CG-20, for design loads H10, H15, and H20 respectively.

On the first three projects, in which this design was offered in competition with other methods, it won by substantial percentages. The low bidder bid a total of about $126, 000, and the total lowest bid on the other designs was some $39, 000 higher. In two of these jobs the alternate construction was the standard Farm to Market flat slab, and on the third project it was continuous I-beam.

On a fourth project in Navarro County, offered in the September 1950 letting, this design failed to receive favorable consideration. The one contractor who has several sets of these forms overlooked this project until the day before the letting, and was unable to submit a bid, and the only bid submitted for this design was not low.

In addition to the projects now under contract by the Highway Department, Burleson County built seven bridges last year using this design. The concrete surface on all of these bridges,



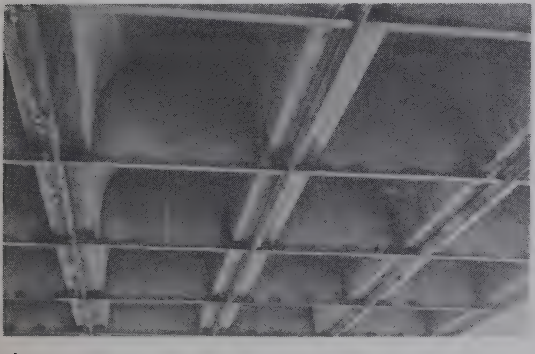
◆ Forms in place on two spans. The near span has been poured.

as well as our bridge in Presidio County, has a texture almost like marble, and honeycomb is practically nonexistent.

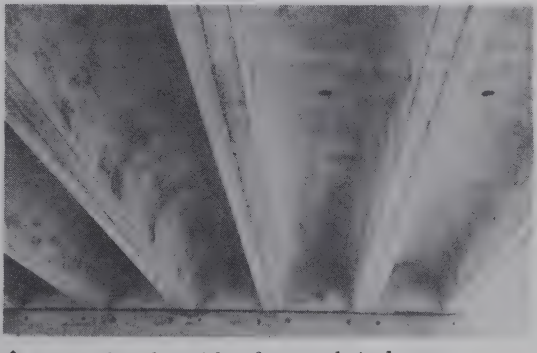
DESIGN FEATURES

The CG Series is a 30' concrete girder span, which in cross section, is a series of multiple arches, and utilizes the same steel forms regardless of the design loading. The roadway width varies in increments of 3' and may be made as wide or as narrow as is necessary, without a change in design. The forms support the green concrete without falsework, and are supported on the caps in the same manner as is used with bar joists. They are battered on the sides and ends, so that they slip out easily when the supports are removed.

A set of forms consists of a certain number of interior sections, each 3' in width, to provide the necessary roadway width, two side forms, and two end bulkheads. These are all bolted or clamped together and no wood forms are necessary. They are easily dismantled and will never wear out, except through misuse and improper handling. A pipe nipple is placed at mid-span at the summit of each 3' interior section, and temporarily secured while the concrete is placed. This forms a hole in the slab at this point,



◆ View from below showing the steel forms in place.



◆ View of underside of completed span. Note holes at mid-span for dismantling of forms.

through which a cable sling is passed for lowering the form in dismantling. This hole is left open as a method of relieving trapped air during high-water stages of the stream.

At regular intervals, a transverse reinforcing bar is threaded on each end and extended through holes in the side forms. These serve to support the side forms during the placing of the concrete, and later serve as anchor bolts for the rail posts.

CONSTRUCTION NOTES

The steel form sections weigh about 1200 pounds each and require a crane of some sort for erection. It is possible to strip forms and lower them to the ground by hand operated winch.

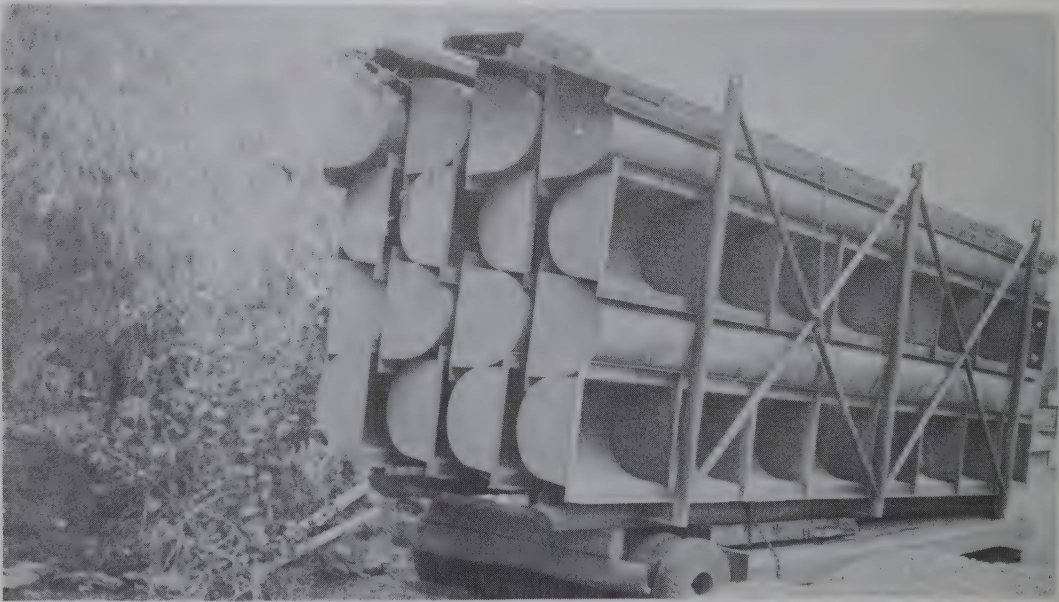
In setting the forms in place, care should be taken that at least one end of each form will be free to drop out. If the caps are poured slightly off-station, no difficulty will be encountered, since the forms can project over one cap so long as they are free at the other end. In the case of two adjacent caps slightly skewed in the same direction, some difficulty will be experienced in removing the forms, and care should be taken to avoid this condition. Where only one cap is slightly skewed, or where two adjacent caps are skewed in opposite directions, no particular difficulty will result, but as a general rule this feature should be kept in mind when the caps are constructed.

Most contractors will probably prefer to use a single hole at the center of the pan form unit for both erection and removal.

It may be advantageous to require leaving the 2"ϕ pipe sleeves in the slab in order to prevent enlargement of the hole by traffic. This feature will be determined after observation of the performance of the Presidio job.

ECONOMICS OF DESIGN

When compared to our standard flat slab construction, this design results in a substantial decrease in the quantities of concrete, re-



◆A load of forms on a lowboy trailer. This is enough forms to pour two 24' roadway spans.

inforcing steel, and substructure units. Also, after several uses in which the original cost of the steel forms is amortized, the unit cost of the concrete should be substantially lower than concrete for the flat slab. The reinforcing steel is so arranged that it may be tied up on racks and set into position with a crane, and this feature should mean slightly lower unit prices on the reinforcing steel. Elimination of the curbs greatly simplifies form construction, and should also further reduce the unit cost of concrete, but this is partially offset by the fact that rails must be provided.

We have insisted on maintaining only one design of this type in order that contractors will not be forced to purchase several different types of forms. Approval has now been secured from the Bureau of Public Roads, and no changes in design are anticipated.

At the present time, only one contractor is bidding this type of work with any great show of enthusiasm. He has six complete sets of forms, which is sufficient for continuous operation, pouring one slab per day. It is hoped that other contractors will shortly enter this field. Several have discussed this design with us, and have indicated a willingness to purchase forms and bid this type of work, if they could be assured that the Highway Department will continue to make use of the design. It is believed that when such assurance can be demonstrated, more lively competition and lower prices will result.

HIGHWAY DISTRICT POPULATION

Rating	1940 Census	District No.	1950 Preliminary Census	Rating
1	740, 951	12 (Houston)	1, 063, 679	1
2	623, 812	18 (Dallas)	816, 071	2
3	467, 988	15 (San Antonio)	632, 128	3
4	354, 628	2 (Fort Worth)	473, 443	4
7	298, 711	21 (Pharr)	410, 577	5
10	253, 777	20 (Beaumont)	330, 182	6
6	304, 171	9 (Waco)	324, 217	7
5	346, 539	* 10 (Tyler)	315, 092	8
12	223, 293	16 (Corpus Christi)	314, 800	9
9	264, 433	14 (Austin)	300, 688	10
14	210, 383	5 (Lubbock)	288, 038	11
8	298, 394	* 1 (Paris)	251, 553	12
11	234, 075	* 19 (Atlanta)	221, 636	13
20	155, 647	24 (El Paso)	220, 714	14
18	183, 860	8 (Abilene)	214, 221	15
19	159, 550	4 (Amarillo)	212, 838	16
17	190, 586	3 (Wichita Falls)	201, 527	17
15	201, 083	* 13 (Yoakum)	196, 679	18
13	222, 256	* 17 (Bryan)	185, 648	19
16	194, 728	* 11 (Lufkin)	163, 109	20
24	75, 887	6 (Pecos)	135, 572	21
21	149, 779	* 23 (Brownwood)	129, 848	22
22	94, 998	7 (San Angelo)	110, 762	23
23	94, 399	* 25 (Childress)	84, 825	24
25	68, 801	22 (Del Rio)	74, 580	25

*Population Decrease

COMMISSION
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A. F. MITCHELL
ROBT. J. POTTS

TEXAS HIGHWAY DEPARTMENT

STATE HIGHWAY ENGINEER
D. C. GREER

Tyler, Texas
August 17, 1950

FILE NO. D-18

Mr. D. C. Greer
State Highway Engineer
Austin 14, Texas

Attention: Mr. J. A. Waller, File D-18

Dear Sir:

This will acknowledge receipt of your letter of June 13, 1950, requesting comments of this office on the use of asphalt emulsion, specification Stencil No. 5-48-1596, to be used in placing a seal coat on US 80 in Wood County from the Upshur County line west about 12 miles.

This District has been using this material for about two years and, we think, with excellent results. We apply the emulsion on one half the road at a time. After application of the emulsion from 20 minutes to one hour is allowed to give the emulsion time to break before covering with aggregate. Shortly after covering we follow up with a roller and hold traffic off of the newly applied section for about one hour. No drag broom is used on day of application. The next day a drag is run over all sections applied the previous day and again rolled. After this there is nothing further to do as very little aggregate is thrown to the shoulders and no curing is necessary.

If applied somewhat in the manner as outlined above, our experience is that flying stone is greatly reduced and practically eliminated after the first few hours. Bleeding is practically eliminated since the asphalt contained in the emulsion is only about seven-tenths as much as contained in oil asphalt with better adherence of aggregate. Stripping is reduced. Streaking will depend upon the performance of the distributor and emulsion should give about the same results as oil asphalt.

The rate of application of emulsion and aggregate should be about the same as used when applying oil asphalt. Less residual asphalt is therefore applied, but for reasons unknown to us, better aggregate adherence is secured, thus accounting for reduction in flying stone and a better non-skid surface.

Based upon our experience over the past two years we definitely recommend this material for seal coat work over oil asphalt, particularly on high traffic roads.

Sincerely yours,

AC Gentry

A. C. Gentry
District Engineer

ACG:mh

THOUGHTS AND THEORIES ON PENETRATION ASPHALT SURFACES *

A. J. VAN DYKE, *Senior Resident Engineer*

In order to place credit, it must be said that the data contained in this paper are gleanings from a number of papers and articles that were compiled by men who have had a great amount of experience and unlimited laboratory assistance both of which are essential to develop and support any engineering theory. Application of the theory is necessary for final proof. Some of these ideas have proof and some have not.

Asphalt surface treatments as defined by the Asphalt Institute are applications of asphaltic material to any type of road or pavement surface with or without a cover of mineral aggregate which do not produce an increase in thickness of more than 3/4". An asphalt seal coat or a single treatment is a thin surface treatment seldom over 1/2" thick and double surface treatments are successive applications of asphalt material and mineral aggregate. Although commonly called penetration surfaces, they are really inverted penetration treatments as the bitumen must work upward instead of downward to mix and bind the aggregate.

Since our particular problem at this time is that of seal coats, we will direct our ideas in that direction rather than dwell on other treatments.

A seal coat is intended to serve one or more of the following purposes:

(1) To prevent the entrances of moisture into the main course by sealing the surface.

(2) To reduce the circulation of air through the mat and thereby lessen the effect of oxidation.

(3) To produce a nonskid riding surface.

(4) To increase the resistance to traffic abrasion.

(5) To make the surface more visible at night. The increase in visibility depends upon the color of the cover aggregate and is only effective when the exposed faces of the cover aggregate are not covered with bitumen.

Although being desirable that a seal coat bleed very slightly and be thoroughly kneaded into a well knit mat in addition to binding well with the existing surface and its openings, we find that traffic is very unwilling to co-operate and lend its use to our problem when any stickiness is present. On the other hand, an excess of cover material which prevents the stickiness of bleeding is very uneconomical and provides a traffic hazard of flying gravel. A combination of asphalt and aggregate which thoroughly seals the surface and yet does not bleed or have excess loose aggregate is the desirable answer.

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* *Presented at the Bi-Monthly Engineer Meeting on June 22, 1950 at the District Office, Ft. Worth, Texas*

The quantity of asphalt required depends upon the following:

(1) The roughness of the old road surface.

(2) The capacity of the old surface to blot up or absorb or in an opposite manner be so rich as to increase the total bitumen.

(3) The percentage of voids in the stone as spread upon the road.

(4) The absorption capacity of these stone particles.

At the present time we have no tools for measuring or calculating the magnitude of some of the variables.

The amount of bitumen required will vary with the amount, size and porosity of the aggregate and with the consistency of the bitumen used. The amount and sizes of aggregate to be used will depend upon the thickness to be obtained by the treatment and the number of applications of bitumen and aggregate required to obtain that thickness. Referring to a double treatment, no more aggregate should be used in one application than will contact the film of previously applied bitumen, consequently, the amount needed is that which will cover the area to a depth of one particle of aggregate.

The fact that regardless of the amount of cover stone placed the final layer that adheres will only be one stone in thickness was advanced by Hanson of New Zealand; is being used by the California Highway Department as a design basis and is being generally accepted in the United States and South America. To determine the thickness of the stone Hanson actually used calipers, the "flats" as he called it being the governing dimension. Engineer Tagle of Argentina developed a slotted screen and California uses a system known as the "effective maximum size." The California scheme seems most usable and can be explained simply. The "effective maximum size" is determined as the theoretical sieve size in inches which would allow 90% of the screenings to pass through the openings. This "effective maximum size" scheme was developed by Mr. Lovering, Materials Engineer of District 1, State of California, and Mr. F. N. Hveem, Materials and Research Engineer of the State of California, and the developer of the stabilometer test for asphaltic concrete. With the "effective maximum size" known there must be a relation established between this measurement and the loose volume of cover stone required to produce a final layer one stone thick. This relation is known as spread modulus" and necessarily varies with the type of aggregate. This system allows the quantity of cover stone to be calculated to which theoretical amount must be allowed 10% or 20% for "whip-off." This survey of Mr. Hveem's work has not as yet brought forth the exact method by which he determines the "spread modulus" which is the important equation. Mr. Hveem himself is not satisfied with his "spread modulus" determinations and admits to some nonconsidered variables such as character of rock surfaces and the shape of rock particles.

It is the belief of Mr. Hank, former Engineer of Materials and Tests, and Mr. Marshall Brown of the Testing Laboratory in Austin that excess fines in cover stone are a definite cause of aggregate loss. This belief is substantiated by laboratory tests. After one job in this state lost almost all of its cover stone within a few days after application, a check of the accepted material showed that although the specifications limited the -10 material to 5% much of the aggregate contained up to 13% -10 size and was also high on the 1/4" to #10 fraction. It was found that a reduction in the -10 size to 6.7% (still outside the specifications) reduced the aggregate loss from 72% to 57% and that eliminating the -10 fraction altogether lowered the aggregate loss to 30%. These results show that the 1/4" to 10 fraction exerts blotting action and hinders the embedding of larger aggregate.

With the knowledge in mind that -10 material is a foe of retention as is a high percentage of 1/4" to 10 size it would seem that Grade C material or Grade F as set forth in Land Service Specifications would be more desirable than regular Item 303-A as Item 303-A requires that up to 90% must pass the 3/8" screen while Grade C provides that 60% should be retained on the 1/4" and Grade F requires that 70% should be retained on the 1/4".

In addition to the screen requirements we believe that a decantation test should be instituted to determine the dust and dirt in cover material and to provide a definite test for cleanliness to eliminate differences of opinion as to what constitutes "clean" material.

Some engineers have a low regard for gravel as aggregate but we have used gravel with equal or better success than crushed stone and we believe the gravel superior at least as far as absence of dirt and dust is concerned. The sharp edges of crushed material as an aid to mechanical interlocking cannot, of course, be disregarded. Some engineers are of the opinion that crushed material with its flatter sides adheres better than gravel. Retention tests have shown that there is practically no difference in the retention qualities of gravel and crushed stone but that crushed natural rock asphalt is vastly superior to either. Unfortunately, we do not have that material available. Gravel usually has less voidage and is more desirable from that point of view.

Mr. Hanson proposed a method of determining the amount of asphalt necessary to use with a given aggregate. His method is recognized by the Asphalt Institute as being the best approach to the problem to date. Mr. Hanson observes that the amount of bitumen should not be less than 50% more than 70% of the void space in the compacted cover coat. The roller compacted cover course contains about 30% voids while the final traffic compacted course contains about 20% voids. A rundown shows that the final compacted depth of aggregate amounts to about 63% of the original loose coverage and that 20% of the final volume is voids of which it is desirable to fill an average of 60% asphalt. This gives an asphalt volume of 7.6% of the original loose cover material. We have checked this method when cover material was specified in the amount of 1 C. Y. to 140 S. Y. and find the asphalt quantity to be 0.113 gallon per square yard where 0.30 gallon per square yard was specified and used satisfactorily. This difference is explained by the fact that the design allows nothing for absorption by the base or old pavement which apparently approximates 50% of the seal asphalt if this method is correct. Therefore, Mr. Hanson's method will apply only to a non-absorbing surface and we must rely on experience to judge the amount of asphalt to be added to care for surface and aggregate absorption of the asphalt material.

Many authorities are advocating the use of cutback or emulsified asphalt. The use of this type of material allows better distribution of bitumen itself and thus permits a lighter application of asphalt. The thinness of the cutback or emulsion results in greater penetration of the base and thus gives better treatment of cracks in the old surface. Emulsion or cutback also allows the use of a hard base asphalt which is the residue and the cementing medium and authorities seem to agree that a hard asphalt is superior for this purpose. Rapid curing cutbacks are favored with a hard base asphalt and an accelerated volatile. The Socony-Vacuum Oil Company advocates a cutback with a base asphalt have a penetration of about 90 to 50 with fast curing properties. Our Texas Highway Department "Curing Index" test is recognized as being the foremost development in determining curing rates. It is without a doubt a risk to use our present cutbacks that are available when a large volume of traffic exists. Some of the large oil companies are now working toward the development of a proper cutback for the purpose we have in mind.

Without going into the controversial question of the desirable penetration of asphalt to use it is necessary only to say that District 2 has decided upon the use of OA-135 asphalt which is less fluid at road temperatures than OA-230 which was formerly in favor. Laboratory tests have shown that regardless of the penetration of asphalt used that bleeding will occur anytime the retention of aggregate is insufficient. Our laboratory in Austin has shown that with other factors remaining the same, that aggregate loss shows a gradual increase with decrease in the penetration of asphalt. It is the belief however, that this is a temporary holding only and it appears that the harder OA-135 seems to be desirable to give a long-time holding value.

Although moisture in cover material is detrimental to the process of adherence of aggregate at the present time there seems to be very little that can be done to provide dry cover material at the time of placing.

We are of the opinion that specifications should provide the number of maintenance days required and maintenance days should be days that would be suitable for shooting asphalt. Nebraska requires three maintenance days and a minimum of twenty-three roller hours per mile.

This study has led to the belief that the amount of asphalt must be based on judgment and experience and the amount of cover stone must be carefully selected in ratio to the amount of asphalt. The number of unknowns that enter into the amount of asphalt necessary for a given surface are so numerous and so variable that we doubt seriously if an exact mathematical method can be developed. We can, however, better matters a great deal in our choice of aggregate quantity and grading and by insisting upon cleanliness of the aggregate itself.

We believe a seal coat should either have the qualities of adequate penetration to fill cracks in old surfaces or that armor coats should be applied that contain aggregate of sufficient size to bridge cracks and of sufficient thickness to have inherent strength that will resist cracking. About 80% or 90% of our present seal asphalt is placed on flat surfaces between cracks where it serves no purpose whatever unless possibly holding aggregate to form a non-skid surface. Our problem is not that of developing a non-skid surface nor of thickening but that primarily of repairing holes in a roof whose purpose is to protect against weather. At this time it seems the distributor method of placing seal asphalt is probably the most economical when application methods are considered even though a vast percentage of the asphalt placed is actually not required and serves little purpose. We must be certain that the asphalt actually working is of the very best type suited for the job it has to do. Obviously the best treatment of a cracked asphalt surface is to seal it by penetrating the cracks, however, we do not believe our present methods have caused much penetration sealing but merely thin surface sealing that is not long lived. This, I believe, is building a weak bridge where we need a strong one.

In 1946 we applied asphalt surfaces to two sections of road in Jack County that I believe serve to illustrate that a double treatment is economical. On U. S. Highway 281 north of Jacksboro a double was placed because of its extremely bad condition while on State Highway 24 west of Jacksboro only a single was placed. A seal is to be placed on #24 again this year that should have been done last year as both the surface and base are in an extremely bad condition - so bad that to my mind a single treatment will do little toward correcting the situation. U. S. 281 on which a double was placed is in an above average condition and shows no evidence of map cracking at all but does have some dry weather cracks. A seal placed on this road would be 95% useless. Thus the double which costs two and a half times more than the seal is still satisfactory and has given adequate protection to the base and subgrade and, it must be remembered, was placed on a surface that was in the worse condition of the two roads. Had a double been placed on #24 we think it would have been well worth the money.

We recently had a half day's visit from Mr. J. E. Gray, Field Engineer of the National Crushed Stone Association, who gave us one or two good points on asphalt work that is being done in other states. Mr. Gray is in charge of the laboratory at Washington, D. C. for the National Crushed Stone Association. He admired the work being done in North Carolina above all other states. In this state, it is well to note, they have required the washing of all asphalt aggregates for the past fifteen years.

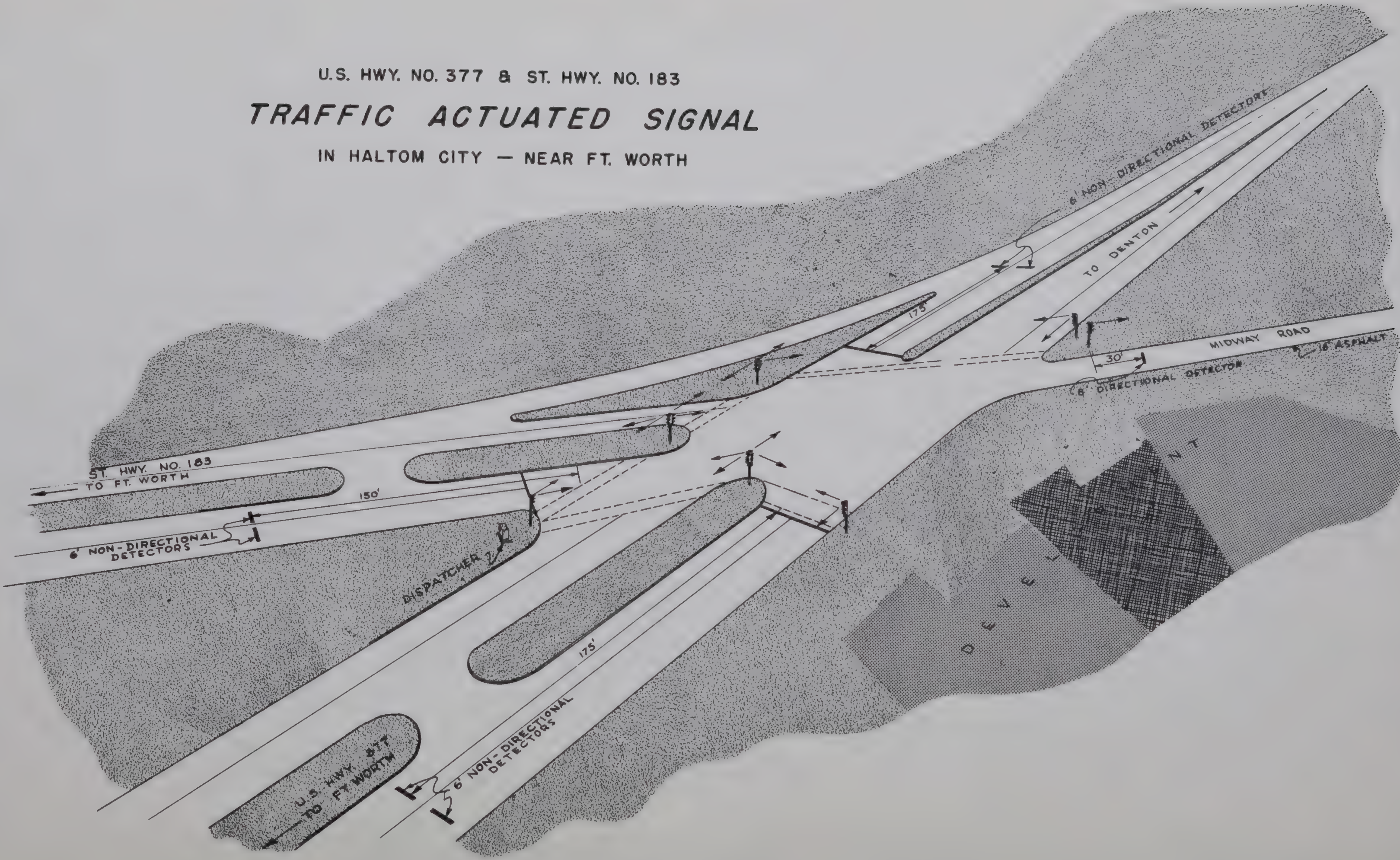
Mr. Gray gave me a "rule of thumb" method for determining the proper ratio between rock and asphalt which he claims has proven to be quite workable over a period of years. This rule is that any asphalt application design with a ratio of 0. 1 gallon of asphalt per S. Y. to 10 pounds of rock gives good results. As a check on this method we have taken a double application that we have used for a number of years in which 0. 6 gallon of asphalt was used to a number 1 stone amount of 1 C. Y. to 80 S. Y. and number 2 stone was in the amount of 1 C. Y. to 180 S. Y. . This combination resulted in a ratio of eight and a half pounds rock to o. 1 gallon asphalt. Further we have checked the ratios between asphalt and rock on the seal coat project we are just finishing and find them to be inadequate in rock according to the "rule of thumb" method and more rock has been necessary. In Palo Pinto County the ratio results in 6. 7 pounds rock to 0. 1 gallon asphalt. In Jack County 6. 7 pounds to 0. 1 gallon asphalt. In Hood County 7. 3 pounds to 0. 1 gallon asphalt. Palo Pinto and Jack were set up 0. 3 gallon per S. Y. and 1 C. Y. to 140 S. Y. to rock. Hood was set up . 35 gallon per S. Y. and 1 C. Y. to 110 S. Y. to rock. These weights are based on the weight of 2800 pounds per C. Y. for cover material which is on the high side as the average material weighs 2600 or 2700 pounds.

* * *

U.S. HWY. NO. 377 & ST. HWY. NO. 183

TRAFFIC ACTUATED SIGNAL

IN HALTOM CITY — NEAR FT. WORTH



TRAFFIC ACTUATED SIGNAL

TRAFFIC SERVICES DIVISION

PURPOSE: Traffic-actuated signals are a comparatively recent device for alternatley assigning the right-of-way to vehicles at intersections. The first traffic controller was the police officer. The officer was followed by the hand operated semaphore signals, which were in turn followed by the automatic electric signals with the fixed-control for allocating green time to the two or more streets under a predetermined schedule based on past traffic flows.

Finally, came the traffic-actuated signal which operates on the basic principle of apportioning the green time or right-of-way to intersecting streets in accord with the instantaneous demands of traffic. Since the relative demand for the green signal on intersecting streets may fluctuate considerably during the day, the traffic-actuated signal reduces the delay of traffic to a minimum by automatically adjusting the allotment of the green time to the streets in proportion to the volume of traffic they carry.

DESCRIPTION: The traffic-actuated signal installation consists of three major parts: first, a device for telling of the presence of traffic called a vehicle detector; second, a device for acting on this information called a dispatcher; and third, a device for indicating the assignment of right-of-way to the motorist or the pedestrian called a signal head.

A traffic-actuated signal installation may look just like any fixed-time (stop and go) signal installation. The reason for this is the signal head containing the red, yellow, green, or arrow lenses is the most prominent part of the installation and is exactly the same as those used for fixed-time (stop and go) signals.

The vehicle detector unit located in the roadway to indicate the presence of vehicles on the intersecting streets may be one of several types: pressure-sensitive, magnetic, sound-sensitive, or light-sensitive. The most commonly used types in present day practice are the pressure-sensitive and magnetic detectors which are inserted in the pavement.

The detectors are installed in such a way that each vehicle approaching the intersection registered an impulse which is transmitted to the dispatcher. The distance of the detector from the intersection depends upon the speed of traffic, the grade of the approach, and the smoothness of the pavement.

The function of the dispatcher is to receive the vehicle impulse from the detector unit, assimilate the information, and then assign the green time to one of the streets. The type of dispatcher for any particular signal installation depends upon several factors such as volume and speed of traffic, physical characteristics of the intersection and its relation to other intersections.

OPERATION: The principle operating characteristics of the dispatcher are briefly as follows:

The amount of green time that any one street gets is made up of several periods or intervals. The first period, called the initial interval, is given at the start of the green to permit traffic waiting at the signal to get into motion. The next period, called the vehicle interval, is the time allowed for a car approaching a green light at average speed to travel from the vehicle detector to the intersection. If a vehicle crosses the detector before a preceding vehicle clears the intersection, the unexpired portion of the vehicle interval set up by the first car is canceled and a new vehicle interval is set up for the succeeding car. This process is continued indefinitely, if the traffic is heavy, subject to termination by a maximum timing interval which does not permit the green to remain on any one street beyond a given predetermined time regardless of the amount of traffic it carries if a car has passed over the detector on the other street. At the end of the green time, the yellow comes on for a sufficient length of time for traffic in the intersection to clear, and then the signal goes to red.

The dispatcher does not waste any green signal time on a cross street should the traffic fall off to the point of having only an occasional vehicle while the main highway continues to carry heavy traffic. This occasional cross street vehicle will get a minimum green time of the initial interval, described in the preceding paragraph, of about six seconds plus one vehicle interval, also described in the preceding paragraph, of about four seconds, and then the green signal can be recalled to the main street by vehicles passing over the main street detector.

Normally, the green signal is given to either street only when a vehicle crosses the detector, and it will remain green on that street until a vehicle crosses the detector on the cross street. However, "recall switches" may be provided which will cause the green signal to return automatically to a selected major street after the traffic on the cross street has cleared the intersection if this is desired.

Referring to the sketch, if a vehicle crosses the detector on S. H. 183 while the green signal is on U. S. 377, the green signal will be transferred to S. H. 183, after the proper yellow warning time, as follows:

a. Transfer immediately, providing a vehicle has not passed over the detector on U. S. 377 for a time long enough for a vehicle to clear the intersection.

b. Transfer after a predetermined maximum length of time despite continuous passing of traffic over the detector on U. S. 377.

If traffic is very heavy on U. S. 377 and this highway has had the green signal for the maximum set time during which a vehicle has passed over the detector on S. H. 183, the green signal will be transferred to S.H.183 even though the last vehicle that crossed over the detector on U. S. 377 has not cleared the intersection. This last vehicle that passed over the detector on U.S. 377 but got caught by a red signal before it could get through the intersection is not forgotten, however. After the traffic has cleared the intersection on S. H. 183, the green signal will automatically return to U. S. 377 without another vehicle on U. S. 377 having passed over the detector. This memory feature prevents vehicles from becoming trapped between the detector and the intersection when the signal turns red.

TYPES: The type of traffic-actuated signal, described above, is a full actuated signal because all of the intersecting streets have vehicle detectors. If only S. H. 183 and Midway Road has detectors, it would be a semi-actuated traffic signal. In this case, the green signal would remain on U. S. 377 at all times except when a vehicle passed over the detector on S. H. 183 or Midway Road.

It might be of interest to note that the detector on Midway Road is a "directional" detector. Only vehicles passing over this detector while traveling toward the intersection will make a call for a green signal. This type of detector is usually used on undivided roadways where it is possible for a vehicle to pass over the detector as it leaves the intersection.

PEDESTRIAN PROVISION: What about the pedestrian? If the vehicles passing over the detectors are not frequent enough to provide the pedestrian a chance to cross a street on a green light without his having to wait an unreasonable length of time, pedestrian push-buttons are provided. These buttons may control the green light exactly the same as the vehicle detectors or they may call for a longer green time to allow more time for pedestrians to cross.

SUMMARY: The main things to remember about the traffic-actuated signal are: (1) the green signal time is automatically divided between two streets in proportion to the volume of traffic they carry, and (2) the length of the green signal time on any one or more streets is automatically changed to meet the demands of traffic on that street. These two things mean the maximum possible efficiency of traffic operation at a signalized intersection.

[redacted], Texas
August 8, 1950

Mr. Fred T. Bennett
Engineer, Traffic Services
Texas Highway Department
Austin 26, Texas

Dear Mr. Bennett:

Receipt of a Bulletin from Mrs. Defee, who is Councilor for District Two of Texas Garden Clubs, Inc., prompted this letter, due to the sad experience of the [redacted] Garden Club's ambition to assist in beautifying highways in Texas.

The Bulletin received advises that we Garden Club members are to strive even harder this year to help make [redacted] Texas a "RED BUD GARDEN OF AMERICA." I feel sure that you will receive many requests from various Garden Clubs regarding information for planting, and I trust you will discourage it for they will be sorely disappointed. The members of our Club worked like dogs to raise enough money to beautify the highway approaches of [redacted] into [redacted], planting 100 red buds and 100 crepe myrtles. Mr. [redacted] was kind enough to come up and stake off our area to be planted but now the sad part, the men who mowed the highway cut all of our plantings down with the exception of possibly a dozen or more that were planted where the property owners cared for them. It is not an easy thing to get $115.00 together by a small community Club and when mowers are turned loose to cut your efforts down, it's rather disgusting.

I fully realize that you can do nothing about this problem of ours but you can discourage others who work as diligently as we did to get the money for this purpose. We expected to lose some of the plantings but not in this manner, as the hazard we were told about was fire, but we have not even come to that yet.

When we have our District meeting in October it will give me an opportunity to maybe warn others not to make the same error we made.

Mr. [redacted] advised me at the time he was here that you had a supply of booklets on Native Flora of Texas, also Facts and Imaginary Tour that could be had for the asking, since we are planning a program on the Wild Flowers of Texas I thought we might get some information for this to use. I would need 30 copies of each.

Please do not think of me as a "Grouch", really I am not, just disappointed over losing my plantings.

Thanking you to send the books along to me for use in our program, I am

Very truly yours,

[redacted], Pres.
[redacted] Garden Club
[redacted], Texas

TABULATION OF ACCIDENTS INVOLVING STATE OWNED EQUIPMENT

FOR THE FISCAL YEAR 1949 - 1950

District No.	Total Accidents 1949 - 1950
1	8
2	4
3	11
4	5
5	4
6	3
7	0
8	10
9	6
10	6
11	7
12	9
13	13
14	1
15	3
16	0
17	5
18	19*
19	4
20	5
21	1
22	1
23	4
24	3
25	0
Total	132

*9 in city of Dallas

USE OF SALT FOR ICE CONTROL IN DISTRICT 2

ROGER Q. SPENCER, *District Maintenance Engineer*

With the approach of the winter season the Department will soon be concerned with treatment of icy roads. During the last few winters we have established some procedures for this District in the use of salt, sand, and equipment which have been very helpful in treating icy roads, and which we think may be of interest to other Districts. The method of utilizing salt on icy roads to secure the most favorable results has been our principal concern.

During each of the last three winters we have used from fifty to one hundred and fifty tons of salt in various ways and under many different conditions. We have settled on three procedures. They are generally divided as follows.

1. TREATED SAND STOCKPILES

Shortly before the seasonal freezes are due the stockpile of treated sand is made by levelling the top of the sand stockpile, adding a layer of salt containing one hundred pounds of salt per cubic yard of sand, and lightly covering the salt with sand. After several rains the brine coats the sand grains and the material is ready for use.

The salt content lowers the freezing point of the moisture in the sand enough to keep it from freezing and improves its action when applied. Keeping the sand from freezing in the stockpile allows it to be loaded easily and permits more uniform distribution when spread on the road. The salt coating on the sand particles causes the ice to melt enough to tie them in, which reduces the amount of loss due to whip-off.

Stockpiling has several advantages over other methods which we think justify its use. The ease of handling during freezing weather is one principal advantage. The other is that it avoids the necessity of storing a large quantity of salt, which due to the space required and its corrosive action, is a problem in itself. Disadvantages of stockpiling are that the salt will leach away after about two months normal rains causing the salt in any material that is not used to be wasted.

2. SAND - SALT MIXTURE AS NEEDED

In this method the sand and salt is mixed as it is loaded in the truck for use. We generally use one hundred pounds of salt per cubic yard of sand but this is often varied according to the weather and road conditions.

This method is flexible and we use it to supplement the treated stockpile material.

3. DIRECT SALT APPLICATION

This method is used on heavy traffic grades and intersections where compacted snow, sleet, or ice should be removed as soon as possible and to reduce time and labor requirements in emergencies.

There can be no set rate on the amount of salt to use as the temperature and thickness of ice will govern. The salt penetrates to the pavement and melts the ice from the bottom upward, and when the ice becomes loosened from the pavement the traffic begins to make the frozen material mushy. The snow and ice should be bladed off or windrowed and hauled away as soon as possible to prevent spall damage to structures and concrete pavement.

For emergency work, especially at night, two men with one truck loaded with salt can cover as many intersections and hazardous grades as four or five trucks hauling sand. This has been our experience especially when the icy condition is only a thin sheet of ice.

For application of salt and abrasives we have a Model TS-S Burch whirler type sand spreader for each maintenance section which is used especially at night and in addition to hand spreading during the day.

The salt we use is Rock Salt, Number 1 Grading, which is the same grading used as ice cream salt. The cost of the salt purchased last year was $0.79 per 100 pounds, in 100 pound paper bags, f.o.b. Fort Worth.

The use of salt presents a number of problems but we believe its use is justified. Care must be exercised to avoid spall damage to concrete, possible damage to plant life caused by runoff of the salt brine must be considered, and special provision should be made for salt storage away from equipment and supplies subject to corrosion. We believe our use of salt has enabled us to render better traffic service with the greatest possible economy.

COMMISSION
FRED A. WEMPLE, CHAIRMAN
A. F. MITCHELL
ROBT. J. POTTS

TEXAS HIGHWAY DEPARTMENT

STATE HIGHWAY ENGINEER
D. C. GREER

FILE NO. D-18
(JAW)

Del Rio, Texas
August 14, 1950

Seal Coats

Mr. D. C. Greer
State Highway Engineer
Austin 14, Texas

Dear Sir:

During your recent visit to this district we discussed somewhat at length the varying results being obtained in the placing of seal coats and single bituminous pavements.

I am attaching hereto a series of kodak pictures taken on FM Highway 1021 in Maverick County and showing the methods used in this district in the placing of the single bituminous surface treatment. As a matter of fact this in reality was not a single but was a second course of double, the first course of which was placed in the Spring and consisted of an application of MC-3 with aggregate. However the methods being used are the same in all cases and are described as follows.

After thoroughly brooming and removing all foreign matter from the surface of the existing pavement, or the base to be treated, asphalt is placed in what we consider the required amount indicated in picture No. 1. Immediately after the application of the asphalt, aggregate of the proper size and amount is placed by spreader boxes as indicated in picture No. 2. The proper grading recommended is of a maximum size. In this district we use the special provision in which the maximum size is 3/4" with 25-50% on the 1/2", and with a maximum of 5% passing the 10-mesh sieve.

After the placing of the coverstone a pneumatic tired roller is used as indicated in picture No. 4. After the entire surface has been thoroughly rolled with the pneumatic, a drag broom is used as indicated in picture No. 3. By the use of this equipment the stone is more evenly distributed over the section and many small depressions are filled, thereby eliminating an uneven surface.

After brooming the pneumatic roller is again used on the surface, after which the entire area is rolled with a flat-wheel as indicated in picture No. 5.

We have completed our asphalt program for the year with the exception of the placing of some fluxed limestone rock asphalt on a section of State Highway 85 in Quemado Valley, and on a section of U. S. 83 north of Crystal City in Zavala County. We do not start our liquid asphalt work until late May or early June and make every effort to complete all work of this type not later than August 31. We believe that by so doing we secure the maximum aount of efficiency in all operations, as the asphalt remains in a semi-liquid state on the surface and readily binds the proper amount of aggregate placed on it. By the use of the coarser graded aggregate we eliminate almost entirely all bleeding, but of course this also results from the proper amount of asphalt and aggregate. Our usual application for a seal is 0.25 gal. per square yard of OA-175 and the aggregate placed at a rate of 1 cubic yard to 90 square yards.

We will be pleased to furnish you any additional information on the above subject and which you may desire.

Sincerely yours,

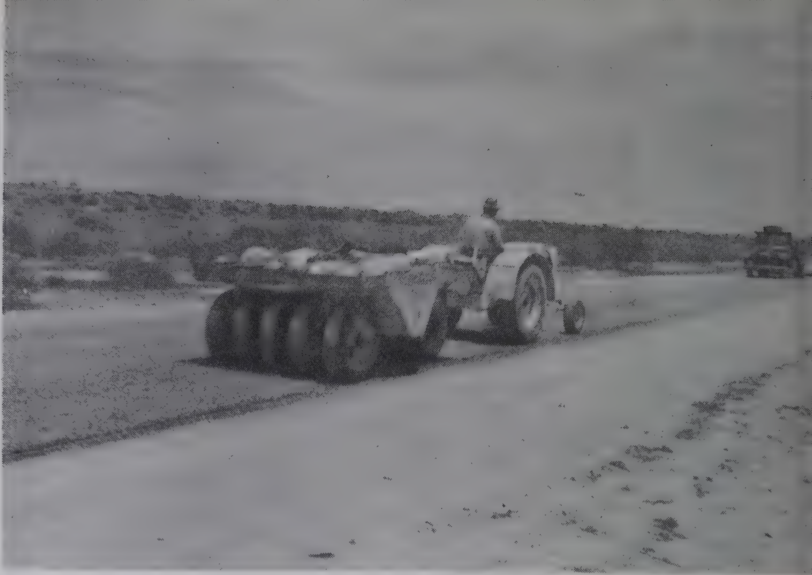
M.B. Hodges.
M. B. Hodges
District Engineer

MBH/gh
Incl.

1.
Placing asphalt

2.
Application of aggregate by spreader box.

3.
Drag broom.

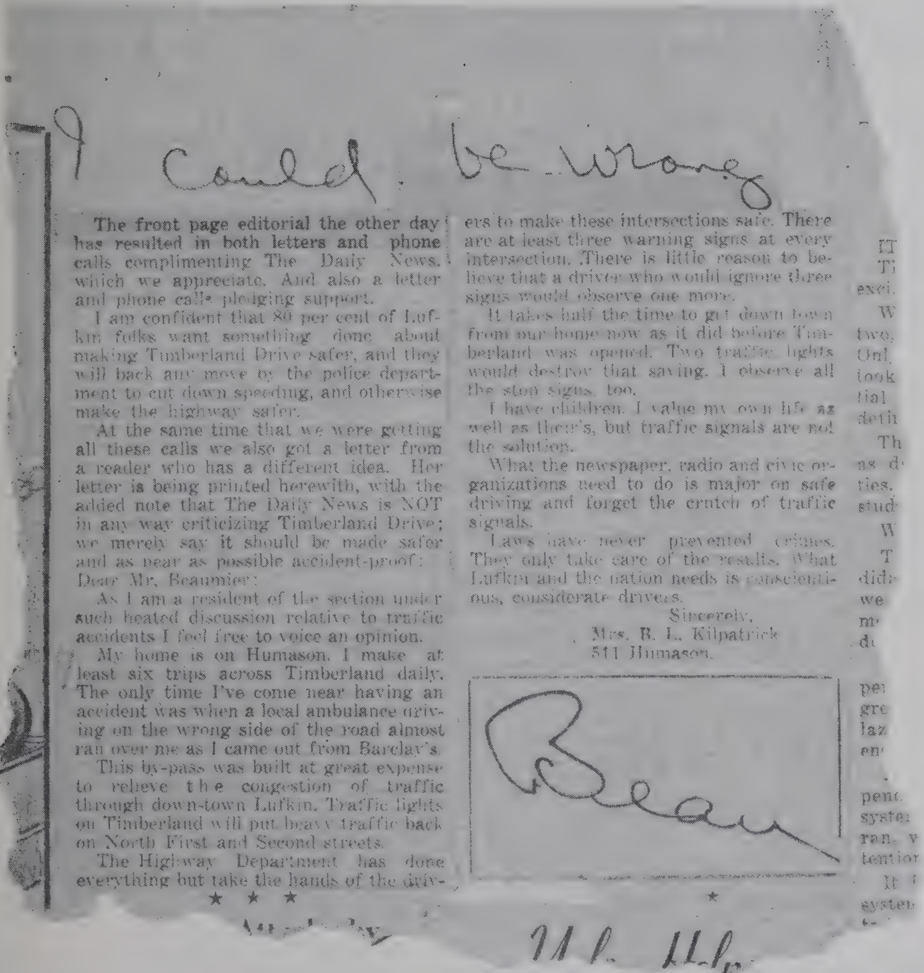


4.
Pneumatic tired roller.

5.
Flat wheel roller.

6.
Loading aggregate.

From the Lufkin Daily News
Friday, August 18, 1950



I could be wrong

The front page editorial the other day has resulted in both letters and phone calls complimenting The Daily News, which we appreciate. And also a letter and phone calls pledging support.

I am confident that 80 per cent of Lufkin folks want something done about making Timberland Drive safer, and they will back any move by the police department to cut down speeding, and otherwise make the highway safer.

At the same time that we were getting all these calls we also got a letter from a reader who has a different idea. Her letter is being printed herewith, with the added note that The Daily News is NOT in any way criticizing Timberland Drive; we merely say it should be made safer and as near as possible accident-proof:

Dear Mr. Beaumier:

As I am a resident of the section under such heated discussion relative to traffic accidents I feel free to voice an opinion.

My home is on Humason. I make at least six trips across Timberland daily. The only time I've come near having an accident was when a local ambulance driving on the wrong side of the road almost ran over me as I came out from Barclay's.

This by-pass was built at great expense to relieve the congestion of traffic through down-town Lufkin. Traffic lights on Timberland will put heavy traffic back on North First and Second streets.

The Highway Department has done everything but take the hands of the drivers to make these intersections safe. There are at least three warning signs at every intersection. There is little reason to believe that a driver who would ignore three signs would observe one more.

It takes half the time to get down town from our home now as it did before Timberland was opened. Two traffic lights would destroy that saving. I observe all the stop signs, too.

I have children. I value my own life as well as their's, but traffic signals are not the solution.

What the newspaper, radio and civic organizations need to do is major on safe driving and forget the crutch of traffic signals.

Laws have never prevented crimes. They only take care of the results. What Lufkin and the nation needs is conscientious, considerate drivers.

Sincerely,
Mrs. R. L. Kilpatrick
511 Humason.

* * *

Beau

COST OF REGULAR MAINTENANCE

Fiscal Year	Average Mileage Maintained	Regular Maintenance Cost	Regular Maintenance Cost per Mi.
1950			
1949	31,419.02	$16,501,732.02	$525.21
1948	27,757.77	13,555,108.76	488.34
1947	25,999.98	11,166,335.88	429.47
1946	25,314.52	9,179,848.42	362.63
1945	24,784.85	8,021,187.83	323.63
1944	24,588.99	7,896,565.13	321.14
1943	24,176.22	6,671,339.21	275.95
1942	23,486.81	6,867,836.29	292.41
1941	23,021.23	6,692,297.14	290.70
1940	22,605.00	8,033,701.35	355.39
1939	21,881.13	7,763,440.41	354.80
1938	21,294.42	6,873,195.28	322.77
1937	21,011.73	6,938,933.60	330.24
1936	20,570.59	7,547,847.11	366.92
1935	20,092.56	7,070,013.07	351.87
1934	19,768.21	6,043,319.73	305.71
1933	19,349.24	6,035,063.60	311.90
1932	18,953.53	6,616,332.14	349.08
1931	18,657.67	6,882,957.00	368.91
1930	18,322.53	7,847,092.78	428.28
1929	18,033.96	8,026,193.62	445.09
1928	17,960.12*	8,906,038.32	495.88
1927	17,960.12*	9,034,718.45	503.04
1926	19,800.00**	7,553,306.00	381.48
1925	19,800.00	5,694,364.57	287.59
1924	16,800.00***	2,390,350.81	142.28

* Mileage in System on September 1, 1928.
** Approximate, 18 divisions, approximately 1,100 miles per
*** Approximate, 16 divisions, approximately 1,050 miles per
Maintenance was assumed on State Highways January 1, 192

SPECIAL MAINTENANCE AND BETTERMENTS

Special Maintenance & Betterment Cost	Total of Regular and Special Maintenance	
	Cost	Cost per Mi.
$3,832,047.78	$20,333,779.80	$647.18
4,363,998.20	17,919,106.96	645.55
5,198,424.58	16,364,760.46	629.41
3,285,383.37	12,465,231.79	492.41
4,939,906.09	12,961,093.92	522.94
6,100,474.47	13,997,039.60	569.24
2,288,284.34	8,959,623.55	370.60
1,747,061.10	8,614,897.39	366.80
2,010,095.43	8,702,392.57	378.02
712,046.32	8,745,747.67	386.89
696,751.82	8,460,192.23	386.64
1,543,856.05	8,417,051.33	395.27
1,181,468.27	8,120,401.87	386.47
1,534,471.10	9,082,318.21	441.52
2,555,966.96	9,625,980.03	479.08
2,641,731.25	8,685,050.98	439.34
4,163,523.67	10,198,587.27	527.08
4,362,641.84	10,978,973.98	579.26
3,714,482.16	10,597,439.16	567.99
4,792,752.95	12,639,845.73	689.85
4,263,088.41	12,289,282.03	681.45
3,264,776.32	12,170,814.64	677.66
	9,034,718.45	503.04
2,746,085.06	10,299,391.06	520.17
2,740,982.32	8,435,346.89	426.03
	2,390,350.81	142.28

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CAMP HUBBARD SHIPPING POSSIBILITIES AS OF NOVEMBER 1, 1950

"Prismo" Sign Kits	Stock
Sign Plates (Steel)	2-6 Months
Reflector Buttons 3/4" White Wood	Stock
Stencil Board	"
Sign Silk	"
Blue Film	"
Adhering Liquid	"
"Bombshell" Torches	Stock
Torch Wicks	"
Torch Hoods	"
Sign Spacers	"
Flag Stand Springs	"
Gasoline Cans (5 and 10 gal.)	Stock
Sample Cans (1 gal.)	"
Sample Sacks	"
First Aid Material (All Items)	Stock
Lab. Supplies (All Items)	"
Texas Flags	Stock
"U. S." Flags	"
Asbestos Gloves	Stock
Welders Gloves	"
"Roper" Pumps and Parts	"
Broom Wire, 14"	"
Broom Wire, 20"	"
PAINTS	
AP-1	Stock
BP-1	"
BP-2	"
BP-3	"
GP-2	"
GR-2	"
GR-3	"
RP-2	"

PAINTS	
WP-2	Stock
WP-3	"
WP-4	"
WP-7	60 Days
YP-1	Stock
YP-6	"
YP-7	"
V-18 Spar Varnish	"
"Prismo White Center-Striping Paint	"
Beads (Center Striping)	"
Paint Stripper	"
Mineral Spirits	"
Toluene	"
White Lead	"
Zinc Dust	"
Replacement Oil	"
REFLECTIVE SIGN MATERIAL	
"Scotchlite" Silver (White) rolls	Stock
"Scotchlite" Yellow rolls	"
Reflectolite (Cut Sheets)	"
Tree Saws	Stock
Shears, Hand Pruning	"
Shears, Lopping	"
Poll Saws	"
Pruning Shears	"
Bark Scrapers	"
Tree Trimmers	"
Gasoline Cans, (5 gal.)	Stock
Gasoline Cans, (10 gal.)	"
Safety Material (All Items)	Stock
Brushes, Floor 16"	"
Mud Jack Parts	Stock
Haul Tickets	"

A PREVENTIVE MAINTENANCE PLAN FOR OUR FLEET

Equipment and Procurement Division

We have probably talked more about this subject and have done less about it than any other one phase of our equipment operation.

At one time or another, every District has either tried a PM plan or contemplated setting up a plan. We have had numerous requests from Districts for a plan they could use. After studying at least twenty PM plans used by commercial fleets, the Army, and the Navy, it was decided we could not pick up a "ready made" PM system and make it fit our fleet because we have too many different types of equipment. By necessity, we must have equipment suited to each job. Also, our method of purchasing on specification bids and at widely scattered intervals has caused our fleet to accumulate quite a variety of makes and models.

After much study, it was decided the best possible way to originate a PM plan for the Department would be to gather all of the ideas and plans which have been used in the various Districts, take the best from each and start from there.

With this issue of the Bulletin, we are submitting a plan used once in District 18 (Dallas) which worked very well for a while. It is requested that each District submit either a plan they have used or their ideas regarding this subject so that in subsequent issues of the Bulletin we can submit these ideas and plans for consideration. Your cooperation is solicited.

District 18's PM plan as outlined in Mr. Melvin L. Smith's letter follows.

◆

COMMISSION
JOHN S. REDDITT, CHAIRMAN
REUBEN WILLIAMS
FRED E. KNETSCH

TEXAS HIGHWAY DEPARTMENT

STATE HIGHWAY ENGINEER
D. C. GREER

Dallas, Texas
July 7, 1948

FILE NO.

Mr. Johnnie Nations
Austin, Texas

Dear Sir:

In regard to our conversation pertaining to properly maintaining our Major Equipment. I think your interest and ideas are excellent, and that a preventive maintenance program should be started as soon as possible. This is to outline a preventive maintenance program as I see it, and as we have proven it. We had such a program for approximately four years before the war, from which we received excellent results, and I think this is the only way that we may expect satisfactory and economical operation of our equipment. We had to postpone our program during the war and up until now because it became impossible to keep men capable of doing the job right. I think a State wide program of this kind would save plenty of money and that our equipment would give much better service and satisfaction. Our program worked like this, first we selected a man from our regular shop crew, this man was a good mechanic, capable of keeping good records willing to work as well as inspect, that believed in the program and who got along well with the men in the field. We made a full time job for him in the field where preventive maintenance and thorough inspection was needed.

We equipped a 3/4 ton Pickup for the job, stocking it with a complete assortment of minor parts, such as, grease fittings, fan belts, spark plugs, battery cables, an assortment of bolts, cotter pins and lock washers, a complete assortment of oil filters, wheel bearings, and other items too many to mention that he found he would need. He had forms for the inspection and a record to make out on all the equipment in our District. When he started out he would go to one section at a time. His duties were to check, adjust and grease all wheel bearings, make minor repairs, check fan belts, brakes, lights, install all oil filter cartridges, start all equipment that was setting up, and put preservative oil in them. In winter time check all equipment for Anti-freeze strength, check all battery and electrical connections, and do any minor repair that he was equipped to do.

Then he had his inspection sheet to be made out on every piece of equipment as he went. This sheet was a form Mimeographed in our Office which just about covered every thing about the equipment, and only required a check mark and remarks by the man. The form covered such things as, inspection of tires, air pressure, battery water, and corrosion, greasing, fittings that would not take grease, oil filters, oil cleaners, water pump, differential, first aid kits, appearance of the equipment, mileage, driver at the time of inspection, cooperation of the operator, cooperation of the Foreman in charge.

Repairs made, repairs still needed. These forms were kept and at the last of the month they were graded as to the manner in which the equipment was taken care of starting with 100%. Each neglect took off a certain percent for instance, dry battery 10%, under inflation of tires 10%, bad greasing 10%, appearance 10%, neglect to report minor troubles such as lights, brakes and so on 10%, first aid features, noncooperation, roughness in operation and so on. A grade was given each piece of equipment and an average grade for each section each month. And the District Engineer was given a copy of the average for the section, he in turn wrote each Foreman praising the ones that received good grades and not much praise for the ones with bad grades. The men in charge of the equipment were very cooperative and were always glad when this man came around, because he not only inspected but brought the kind of service to the field where it was needed. And they were very happy when they received the top grade. It is impossible to explain in a letter all the Merits of a program of this kind. We were unable to find any of the forms used for inspection, but we can make some up if you want them, and if there is any way that I can help, I am glad to do it.

Yours truly,

M. C. Welborn
District Engineer

By: Melvin L Smith
Melvin L. Smith
Equipment Supervisor

District___

PREVENTIVE MAINTENANCE WORK SHEET
TEXAS HIGHWAY DEPARTMENT

Date___________

Equipment No.________Make and Class_______________Mileage_________

(✓) Good (O) Fair (X) Bad

Grade		Grade	
	Greasing:		Cooperation of Operator:
	Brakes:	Repairs Made:	
	Battery:		
	Tires:	Repairs Needed:	
	Lights:		
	Appearance:		

Operator's Name_____________________

Foreman's Name_____________________

Inspected By______________________

PROFIT AND LOSS - EQUIPMENT OPERATION - AS PER STATUS REPORTS
1949 - 1950 FISCAL YEAR
Equipment and Procurement Division

District	September	February	August
1	43971.09	16866.85	8873.29
2	527.69	520.10	10960.66
3	437.50	4596.91	15253.72
4	18843.88	5260.26	6492.35
5	18695.60	14394.56	24134.35
6	5092.59	2812.80	7702.93
7	13632.05	6394.22	13500.02
8	1490.62	20307.78	22064.76
9	25374.20	18130.90	27045.41
10	3021.99	12233.74	27624.31
11	1478.97	14186.29	9916.84
12	12064.91	22466.03	21616.58
13	5651.20	318.76	12436.58
14	55302.39	22631.03	16291.93
15	3646.98	5234.98	17237.21
16	16294.33	4939.40	14811.88
17	10410.96	27983.50	6392.66
18	19087.81	11275.30	17610.85
19	12134.04	2354.36	22553.61
20	44269.81	8271.41	5618.63
21	129.35	15972.00	3567.18
22	4487.77	24138.49	11000.87
23	19541.29	19688.09	767.38
24	9609.68	16562.45	3717.85
25	4115.77	9386.36	3214.61
Total	225956.35	101119.23	242820.76

Texas Highway Department
Form 483-B 1-49-40m

INTEROFFICE MEMORANDUM

Date August 28, 1950

TO: Mr. John B. Nations

Responsible

FROM: J. Shelby Morgan

Desk JBN

SUBJECT: Untreated Lumber

You will recall our recent conversation regarding present lumber situation. In accordance with your request I made a trip to East Texas and contacted several lumber mills, as well as brokers who have connections with large out of state mills. I found that the Government had recently issued an order for forty million board feet of lumber to be produced in Texas and Louisiana. This, of course, will cause a shortage of lumber in these two states. I found that the price of B & B and No. 1 Common Lumber had advanced approximately fifteen dollars per thousand immediately after this order. In approximately one week after this order, I noticed that the Board of Control had failed to receive bids on two requisitions calling for untreated lumber which could be definitely contributed to price fluctuation.

I have contacted several bidders in an effort to obtain a definite delivery date on materials where award had previously been made and in each instance I was advised that the lumber situation was so indefinite that it would be impossible to give a definite delivery date. Some of the bidders asked for immediate cancellation, due to the fact that the present mill price was twenty to thirty dollars higher than their quoted price. I recently checked all lumber requisitions on which shipments have not been made and have contacted each bidder in an effort to obtain immediate delivery, and where a bidder states that he cannot make delivery, such requisition has been cancelled and new bids taken through the Board of Control.

You will recall when this was called to your attention you asked Mr. John Waller to call a meeting and ask Mr. Lawrence Ortolani, Materials and Tests Engineer, and Mr. Percy Bailey, Maintenance Engineer, to attend at which time we discussed the possibility of eliminating inspection by Commercial Laboratory which was agreed upon by all parties concerned. We are now showing this notation on all bids "This lumber is to be inspected at Point of Origin". This could mean that the lumber was to be inspected by commercial inspection or by an employee so designated. This possibly will be beneficial to the producer, as well as to the Department, due to the fact that where amount exceeds ten to twelve thousand board feet it is now necessary to secure the needed amount from approximately five or six different mills and if inspection was required it would necessitate at least two additional inspection charges. This, of course, will tend to lessen the grade to some extent, but it is my personal opinion that we will still be able to obtain lumber meeting our requirements.

So far the Board of Control has cooperated with us in allowing us to secure material on the open market after they have failed to secure quotations. For example: one District requested eighteen thousand board feet of shiplap (which incidentally is more critical than any other lumber) and the Board of Control failed to secure bids and it was necessary to secure this material from twelve different mills and assemble at one point for shipment. This procedure naturally increased the price of this particular lumber, but the District was not deprived of the use of this material.

I do not anticipate that the Department will be seriously handicapped by the present lumber shortage, but it is my opinion that it will soon be necessary to place the purchase of such lumber on a war time basis. I further believe that each District Engineer realizes this condition and will not object to the delay as well as the increase in price.

If you have any further suggestions to offer, I shall be happy to comply with your request.

J. Shelby Morgan

UTILITY TRUCK FOR FIELD MECHANICS

PALMER MASSEY, *District Engineer*

We have a two ton Ford Truck on which is mounted some special equipment, designed for use by our mechanics for work away from district headquarters. This truck is equipped with a power winch and an A-frame. The A-frame can be used in three positions. One position is shown in the pictures enclosed herewith. The base of the A-frame can be moved to the back end of the bed for a high lift and it can be moved so that the bottom ends of the two legs are both on one side of the truck bed. This latter position is not used very often but is handy when the truck is parked on a bridge and the load to be lifted is over the side of the bridge. By using a chain hoist with the A-frame and winch the mechanic can go anywhere and lift the engine from a heavy duty motor grader, power shovel, or other heavy equipment and place it in the bed of this truck for transportation to the District shop for major repairs or overhaul.

The truck is also equipped with a 200 Amp. D. C. arc welder with 110 volt auxiliary power unit that may be used for lights, for operating electric drills and other electric tools. There is also acetylene cutting and welding equipment mounted on this truck.

This truck is used for a number of jobs on construction and maintenance such as placing concrete pipe culverts and heavy steel and timbers for bridges. It is also used as a wrecker to tow equipment to District shop.

This truck and equipment is assigned to C. E. Sledge, who is a combination field mechanic and welder. Sledge and our Equipment Supervisor, J. R. Long, designed the arrangement and all the equipment was mounted on the truck in the District shop.

◆These pictures show the replacing of a heavy motor after repairs have been made in the District Shop.

AGGREGATE SPREADER BOX FOR SHOULDERS AND SMALL MAINTENANCE JOBS

PALMER MASSEY, *District Engineer*

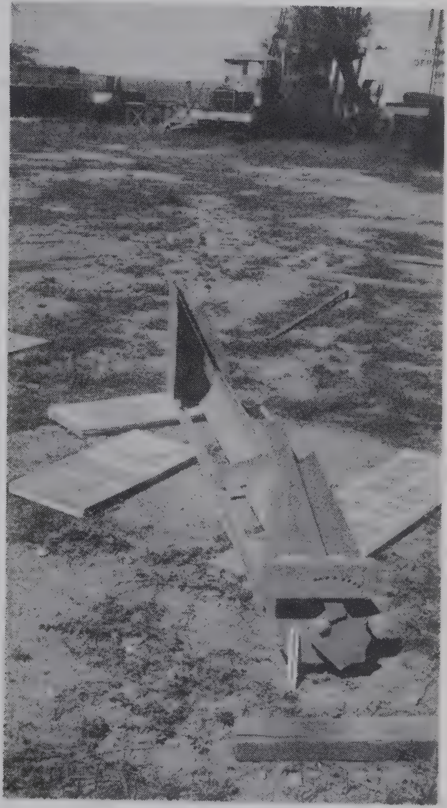
Our maintenance forces are using an attachment on the back end of a dump truck for spreading cover aggregate. These are made in the District shop and we have two in each county. It can be attached to a dump truck in about fifteen minutes. Unlike the usual spreader box, it is not unhooked when the truck is empty, but remains attached to the truck on the trip to and from the material stock pile. When the truck returns with its load of cover aggregate, the driver backs into position and one man steps on the platform and pulls a lever to start the flow of aggregate at the proper time. At the end of the shot, this one operator closes the lever. When the truck is empty, the operator steps off the platform, the truck bed is lowered, and the truck is ready to return to the stockpile for another load. For shoulders, the opening is blocked off to the desired width. If the shoulder is not too wide, the truck can straddle the shoulder and move forward instead of backward. For a large job, the usual spreader box on wheels is preferred, but for small maintenance jobs, our spreader is much easier to use.

The attachment is easy to make. The only material needed is a piece of 10" pipe and a few pieces of scrap steel. The pipe is cut in half and a 1 1/2" slot cut in the bottom. The lever opens and closes this slot. Steel plates are welded to the sides so that it can be bolted to the end gate and to the back end of the sides of the truck.

The pictures show the attachment on a truck and one of the pictures show it on the ground before it is attached to the truck. The platform for the operator is a separate unit and hooks on the top of the end gate.

➧

◆ Aggregate spreader in use.



◆ Spreader before attached.

◆ Spreader attached to dump truck ready for use.

EMULSIFIED ASPHALT SEAL COATS
IN DISTRICT 14

W. D. Dockery, *District Engineer, and*
H. C. Carter, *District Construction Engineer*

U. S. Highway 81 from Williamson Creek in Travis County to near San Marcos in Hays County is a three lane highway carrying between 4, 000 and 5, 000 vehicles per day. The two outside lanes were sealed in September, 1948. In the months following this work it appeared that the number of accidents was reduced. To check this, information was obtained from the Department of Public Safety as to the number of accidents during the year immediately prior to placing this seal coat (October 1, 1947 to September 30, 1948). Also the same information was obtained for the year following the placing of the seal coat (October 1, 1948 through September 30, 1949). The results are shown in Table Number 1.

The number of fatal accidents, the number killed and the total number of accidents was reduced. It will be noted that there was a 17% increase in accidents when the pavement was dry (our guess is that the new uniform texture caused an increase in speed), but a rather large decrease in accidents when the pavement was wet or icy. These figures show a marked decrease in total acci-

Table Number 1

	Fatal Accidents	Number Killed	Total Accidents	Road Condition		
				Dry	Wet	Icy
Before Sealing Oct., 1947 to Sept. 30, 1948	6	10	66	35	26	5
After Sealing Oct. 1, 1948 to Sept. 30, 1949	3	4	49	41	6	2
Decrease	50%	60%	26%	--	77%	60%
Increase	--	--	--	17%	--	--

dents although the traffic count near the north city limits of San Marcos shows an increase of 8.1% in volume between 1947 and 1949, and 8% increase in volume near Williamson Creek for the same period.

Table Number 2

"HIGH VISCOSITY EMULSIFIED ASPHALT"

The material shall be homogeneous. It shall show no separation of asphalt after thorough mixing, shall meet continuous, the viscosity requirements at any time within thirty (30) days after delivery, and shall meet the following requirements:

	Min.	Max.
Viscosity at 122° F.	100	600
Residue From Distillation %	65	
Demulsibility 50 cc, 0.02 N. $CaCl_2$		30
Settlement (10 Days) %		3
Sieve Test, %		0.05
Penetration Residue at 77° F.	100	200
Solubility in CS_2	97	
Ash %		2
Ductility Residue at 77° F.	40	

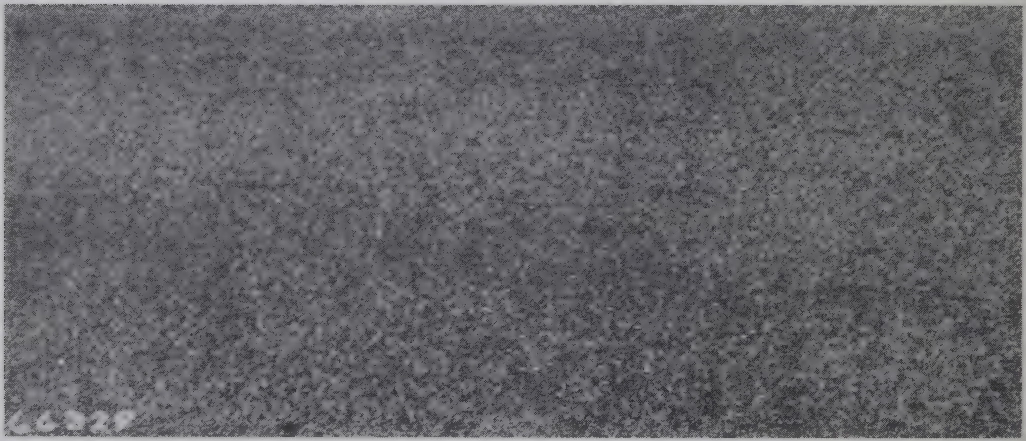
The only change in the condition of this road which might have attributed to this decrease in accidents was a rather inexpensive seal coat applied on the two outside lanes only. This seal consisted of 0.12 gal. per sq. yd. of high viscosity emulsified asphalt on 8.2 miles in Travis County and 0.15 gal. per sq. yd. of the same asphalt on 15.2 miles in Hays County. Both jobs were covered with 5/8" washed, crushed limestone gravel aggregate. Since this first work in 1948, District 14 has placed approximately 145 miles of seal coats using emulsified asphalt and available local cover materials. The results have been very satisfactory to date in that the surface is sealed, the texture is non-skid and presents good light reflecting qualities, the hazard to traffic of loose stones is completely eliminated, there is no bleeding and the treatment is cheap. A more detailed description of this work follows. Pictures Number 1, 2 and 3 show the condition of the seal coat in Hays County after two years service.

Asphalt: The asphalt used in the original work was a high viscosity emulsified asphalt. The specifications for which are shown in Table Number 2.

In the Spring of 1949 the asphalt was changed to "rapid setting high viscosity emulsified asphalt." The specifications for which are shown in Table Number 3.

Picture Number 1

Picture Number 2



Picture Number 3

Table Number 3

"RAPID SETTING HIGH VISCOSITY EMULSIFIED ASPHALT"

The material shall be homogeneous. It shall show no separation of asphalt after thorough mixing, shall meet continuous, the viscosity requirements at any time within thirty (30) days after delivery, and shall meet the following requirements:

	Min.	Max.
Viscosity at 122° F.	100	300
Residue From Distillation %	65	
Demulsibility 35 cc of N/50 $CACL_2$	30	
Settlement (10 Days) %		3
Sieve Test, %		0.1
Penetration Residue at 77° F.	100	200
Solubility in CS_2	97	
Ductility Residue at 77° F.	40	

The rate of application has been varied from 0.12 gallons per sq. yd. on rich and/or slick pavements up to .22 gallons per sq. yd. on dry, raveling or open textured pavements. The shooting temperature for both types of emulsion has been consistently held to 150 degrees Fahrenheit.

Aggregate: This District has felt for a long time, due to increased traffic and heavier loads that the aggregate specified in "Red Book" Item 303A (Seal Coat) and shown in Table Number 4 was too small.

The aggregate soon becomes pushed into or wetted with asphalt, and the result is always bleeding. The first step away from this small aggregate was a special 1/2" grading as shown in Table Number 5.

However, after using this aggregate it was felt that it, too, was too small and the seal coats described herein have been placed using the number 1 aggregate of "Red Book" Item 305, the grading of which is shown in Table Number 6.

This is very nearly the same

Table Number 4

Red Book Item 303A "Seal Coat"

Retained on 1/2" screen	0%
Retained on 3/8" screen	0-10%
Retained on 10 mesh sieve	95-100%

Table Number 5

Special Provision to Item 303A "Seal Coat"

Retained on 1/2" screen	0%
Retained on 3/8" screen	5-20%
Retained on 10 mesh sieve	95-100%
Retained on 20 mesh sieve	98-100%

aggregate as shown in the new Specification S-351, Grade 5. This District has not favored the use of larger aggregate because of the rumbling or roar created by the tires. All of the aggregates have consisted of broken limestone, crushed gravel or natural limestone rock asphalt.

Table Number 6

Red Book Item 305 "Number 1 Aggregate"

Retained on 5/8" screen	0%
Retained on 1/2" screen	0-10%
Retained on 1/4" screen	70-100%
Retained on 10 mesh sieve	95-100%

The specifications for contract work have contained the requirement that 85% of the fragments contain at least one crushed face. When materials were purchased directly by the State, the requirement that 65% of the material by weight contain at least one crushed face has been used. This latter requirement was introduced because it resulted in a cheaper yet satisfactory material since some of the producers in this area have to crush some of the larger sizes and re-combine in order to meet the 85% crushed particles requirement. The rate of application has varied from 1:130 to 1:170, probably the average would be 1:150. Our experience indicates that without close supervision most of our personnel, both resident engineers and maintenance foremen, invariably will apply too much cover material. The ideal is to apply only sufficient to cover the surface and to leave any surplus in the stock pile.

Rolling: The surfaces have been rolled one time with a five ton flat wheel roller and this has usually been all the rolling necessary. Should the surface being sealed be rough to the extent that areas of the pavement would not be in contact with the flat wheel roller, pneumatic rolling would be recommended; but it is necessary to exercise care in the turning of the roller to avoid scaring or blacking up the new surface.

Brooming: Due to the tenderness of the seal coat between the time it is covered and the time it is open to traffic it cannot usually be broomed since a drag broom will loosen and turn some of the aggregate over. There will be no loose aggregate either partly coated or clean if only enough is applied to cover the surface.

Double Applications: Although the subject of this discussion is Seal Coats, this District has experimented with rapid setting high viscosity emulsified asphalt in two course surface treatments. Various combinations have been tried such as:

Number	1st Course Asphalt	2nd Course Asphalt
1	.25 gal. MC-2	.20 gal. RSHV Emulsion
2	.25 gal. OA-135	.20 gal. RSHV Emulsion
3	.25 gal. RSHV Emulsion	.25 gal. RSHV Emulsion
4	.20 gal. RSHV Emulsion	.25 gal. RSHV Emulsion
5	.20 gal. RSHV Emulsion	.20 gal. RSHV Emulsion

Combination Number 1 was used on a section about two miles long. The MC-3 was applied in the winter in sections, as a new base was completed and covered, 1:140, with the same 5/8" stone mentioned throughout this article. The following summer the second course was applied and covered, 1:160, with the same aggregate.

Combination Number 2 was used on a section about one mile long. Both courses were shot within a few days and were covered with 5/8" aggregate. More material was used on the first course.

Combination Number 3 and 4 were used on sections one mile in length. Both courses were applied the same day and both covered with 5/8" aggregate.

Combination Number 5 has been used on about 14 miles. On part, both courses were applied, on the same day; and on part, the first course was kept out ahead to protect finished base. Five-eighths inch aggregate was used to cover both courses. The average rate of cover of the first course was about 1:140 and the second course was about 1:160.

To date the results have been highly satisfactory for each of the combinations tried.

Cost: It must be realized that the cost of this type work is contingent upon many factors including the cost of the materials, the type and amount of aggregate and the distance equipment is moved to reach the project. Table Number 7 shows some typical cost figures.

Protection of the Work: It is the opinion of this District that the most important single phase of this type seal coat is the proper protection of the work for the first few hours after placing the seal coat. Seal coats during this initial time can be completely ruined, that is, the aggregate whipped off and the surface left black or streaked by fast moving traffic. All this type work has been shot in 1/2 widths with the exception of the lighter traffic Farm to Market roads. Beginning with the asphalt season

Table Number 7

Cost of Emulsified Asphalt Seal Coats

Year Placed	Hwy.	County	Rate Emulsion	Rate Cover *	Cost Per Sq. Yd.	Width Feet	Cost Per Mile**
1948	US 81	Travis	.133	1:149	0.044	20	$ 516
1948	US 81	Hays	.148	1:150	0.048	Variable	---
1949	US 281	Burnet	.175	1:126	0.059	20	692
1949	St. 29	Burnet	.162	1:132	0.063	24	887
1949	US 290	Travis	.180	1:149	0.065	Variable	---
1949	US 290	Travis	.182	1:124	0.064	20	751
1949	US 81	Wm'son.	.184	1:130	0.071	24***	1000
1949	US 81	Wm'son.	.171	1:150	0.086	24***	1211
1950	St. 16	Gillespie	.192	1:152	0.068	26	1037
1950	St. 29	Burnet	.182	1:144	0.057	24***	803

* Includes waste at stockpiles, etc.

** Does not include widening or side road turnouts.

*** Original surfacing was twenty feet. Cost as shown includes double on widened two feet on each side.

in 1949 all traffic was stopped by flagmen using the "Stop, Ask Watchman for Road Information" signs. The flagmen controlled traffic with his right hand while holding a red flag in the left hand to attract attention. The traffic was told that we were placing a non-skid treatment on the highway, to drive on the lefthand side of the road, and to please drive slowly until he had passed the next flagman. The flagman on the opposite end stopped all traffic explaining the work and asking the traffic to drive on the right-hand side and to move on the shoulder when he would meet traffic and to drive slowly until he had passed the flagman ahead. The flagmen for this work were selected with great care and the men used were college engineering students. The men were well dressed, neat, had a good command of the English language and had the ability to look directly into the face of the motorist while giving him instructions. Beginning with the 1950 asphalt season in addition to the above procedure, the motorist has been given the little cards explaining the seal coat program. It was found that probably 99% of all traffic responded to the instructions, but in those instances where the car did not stop, the flagman took his license number, a list of which was furnished the Insurance Division, who in turn wrote the motorist a form letter as described in Insurance Circular 2-47, dated July 18, 1947. On a few short projects and in isolated areas the use of regular maintenance employees for this flagging work has been necessary. However, we are frank to state that this flagging was less effective than when we were using the higher type men.

The normal procedure would be to begin shooting in the morning, say on the right side of the road using the center stripe for guide line and continue shooting until about eleven o'clock. Then stop the work until one o'clock. During this entire period the work shot would be protected against traffic by the flagmen described above and by additional short barricades and additional flagmen if necessary throughout the section. At one o'clock this section would be open to traffic and in the afternoon the opposite side would be shot similarly to that described above. The shooting would be stopped early enough in the evening to allow a minimum of two hours curing time before the road was completely open to traffic. If the shoulders being used by traffic were dry and dusty, they would be sprinkled to eliminate the dust hazard and to keep the dust off the fresh asphalt.

Pre-Coated Cover Materials: This District recently conducted some experimental work with precoated cover materials. Nine different types of aggregate were accumulated and samples were prepared of various combinations including crushed limestone, washed and unwashed, limestone gravel, crushed and uncrushed, rock asphalt and siliceous gravel. A portion of each of the samples was separated without precoating; a portion treated with a 10% solution of EA1OS emulsified asphalt and a portion was treated with a 15% solution of EA1OS emulsified asphalt. Also a sample of rock asphalt precoated material and a sample of crushed limestone precoated material were obtained from commercial producers. Aggregate retention tests were run by the Materials and Tests Division, the method of which was described by Marshall Brown at the 23rd Annual Short Course and was transmitted by Administrative Circular 19-49, dated March 22, 1949. In all, 27 tests were run using rapid setting high viscosity asphalt and 27 tests of the same combinations of aggregates were run using OA-230 asphalt. The results of all of this laboratory work has been studied but no conclusive evidence is apparent that would indicate the precoated material to be better than the uncoated material. It appears that the washing of the materials had more influence than the lean precoating which was performed in the laboratory. This precoating in the laboratory amounted to preparing a 10 or 15% solution of EA1OS emulsion (slow setting type). The aggregates were then dipped into the solution and allowed to dry in the open air. The amount of asphalt precoating, after drying, was determined to be between 0.16% and 0.35% by extraction.

In addition to the laboratory work mentioned above, this District recently, in cooperation with the Maintenance Division, conducted some experimental work using the construction methods described in this article except that a number of precoated stones were used along with the same materials uncoated. All the materials used conformed in grading to that shown in Table

Number 6 (Number 1 stone of Item 305) except the rock asphalt precoated material was a little heavy on the amount retained on the 1/2" screen. The materials used and the lengths of the sections are shown in Table Number 8.

Table Number 8

Precoated Cover Materials

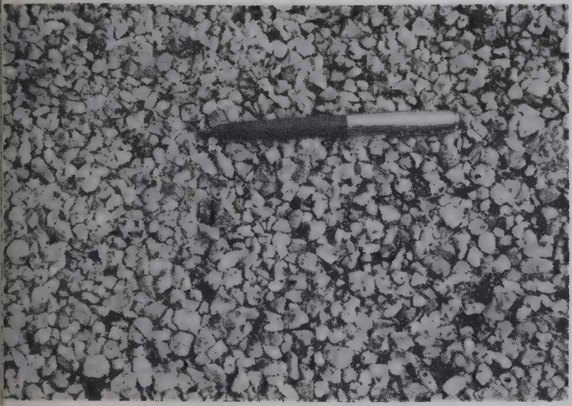
Section Number	Sta. to Sta.	Description	Rate Emulsion	Rate Cover	Cost per C.Y Applied *
1	28+41 43+71	Washed broken limestone	0.15	1:170	$ 3.34
2	43+71 59+01	Washed broken limestone precoated - 15% EA1OS Solution	0.15	1:170	4.34
3	59+01 74+31	Washed crushed limestone gravel	0.15	1:170	4.21
4	74+31 89+61	Washed crushed limestone gravel precoated - 15% EA1OS Solution	0.15	1:170	5.21
5	89+61 104+91	Rock asphalt cover material	0.15	1:170	5.62
6	104+91 120+21	Rock asphalt precoated material	0.15	Lt 1:112 Rt 1:136	6.12
7	120+21 135+51	Unwashed broken limestone	0.15	1:170	5.28
8	135+51 150+81	Precoated limestone .7% OA-230	0.15	1:170	6.12

* These costs vary because materials were from several different sources, etc.

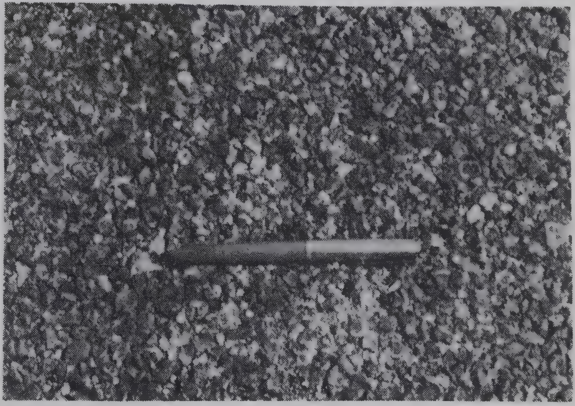
Section #1 was a crushed limestone material which had been washed and contained no minus 10 mesh sizes. Section #2 was the same aggregate which was precoated by our own forces by mixing in a bituminous mixer using 15% solution of EA1OS emulsified asphalt. Section #3 was a washed, crushed limestone gravel. Section #4 was the same as Section #3 except the limestone gravel was precoated by our own forces with a 15% EA1OS emulsion solution. Section #5 was covered with rock asphalt cover material. Section #6 was covered with rock asphalt precoated material. Section #7 was covered with crushed limestone containing 5% minus 10 mesh material. Section #8 was crushed limestone precoated with .7% OA-230 asphalt. The asphalt used in this test work was the same for all sections and consisted of 0.15 gallon per sq. yd. of rapid setting high viscosity emulsified asphalt. The rate of cover was held at 1:170 except that additional material was required on the rock asphalt precoated material (This was probably due to the coarser grading of the material).

In Table Number 8 we have attempted to show the cost of the precoated materials as applied in the test sections. It will be noted that the materials treated by State forces cost $1.00 per cu. yd. for the precoating. This cost could undoubtedly be lowered if a large quantity were treated. In the case of the rock asphalt cover materials we are showing a net difference of \$0.50 per cu. yd. in cost. In the case of precoated limestone we are showing a net difference of \$0.84 per cu. yd. Although costs, as shown in Table Number 8, are not considered reliable since only a small quantity was involved and since the cost of moving a dragline to unload the materials is included, it does show that a long haul on precoated aggregate would be rather expensive as compared with available local aggregates. Other than the difference in price of cover materials the cost should not vary appreciably from the normal seal coats mentioned above.

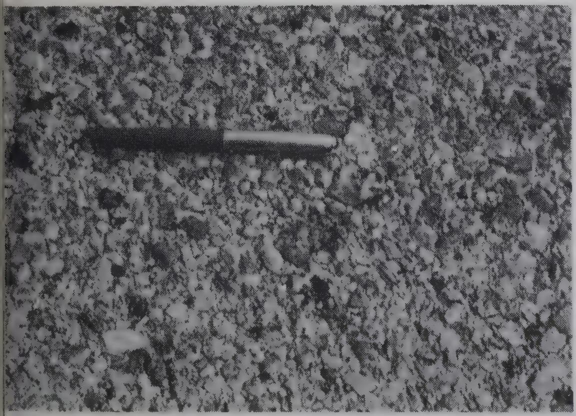
Pictures Number 4 through 11 show the texture of the various materials applied, and pictures Number 12 through Number 18 show the contrast of the untreated and treated materials.



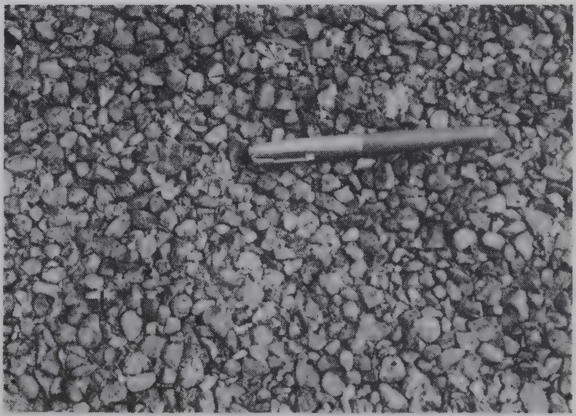
4. Shows the texture of the washed limestone, untreated.



5. Shows the texture of the crushed limestone precoated with EA1OS emulsion solution.



6. Shows the texture of the crushed gravel washed and untreated.



7. Shows the texture of the crushed gravel precoated with EA1OS emulsion solution.

It is not believed that any definite conclusions can be drawn from this precoated test since each material precoated and the same material uncoated have all resulted in excellent seal coats with good texture. A small amount of work was done using these precoated stones to treat badly bleeding surfaces on a project shot early this spring using OA-135 asphalt. The surface in question was bleeding in each of the two travelled ways and therefore the spreader box was blocked out so that the cover would be applied only on the bleeding area. The material was rolled immediately after placing and some of it stuck, but is is not believed there was any more of the precoated material stuck than the uncoated materials, and for several days after this treatment the aggregate continued to whip off until at this time, approximately 30 days after it was placed, it is not believed the results can be justified by the cost.

Do:

1. Watch the high viscosity emulsified asphalt as it is being unloaded for signs of breaking. This can be detected by lack of flow through the pump or heater or by stopping up of the nozzles on the distributor spray bar. This has not been a serious problem in this District but it has happened.

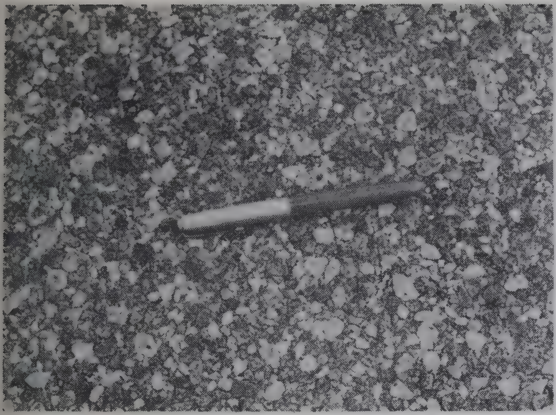
2. Give the new seal coat ample and adequate protection for a few hours after it is shot. Delays such as two hours in the middle of the day may seem objectionable but they are much cheaper than the cost of fighting bleeding for the rest of the summer, not to men-

Table Number 9

"HIGH VISCOSITY EMULSIFIED ASPHALT"

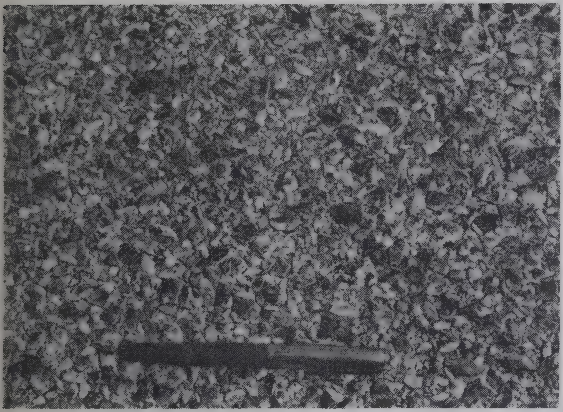
The material shall be homogeneous. It shall show no separation of asphalt after thorough mixing, shall meet continuous, the viscosity requirements at any time within thirty (30) days after delivery, and shall meet the following requirements:

	Min.	Max.
Viscosity at 122° F.	100	300
Residue From Distillation %	65	
Demulsibility 50 cc., 0.02 N $CaCl_2$		30
Settlement (10 Days) %		3
Sieve Test, %		0.05
Penetration Residue at 77° F.	100	200
Solubility in CS_2	97	
Ash %		2
Ductility Residue at 77° F.	40	
Freezing test 3 cycles	Passing	

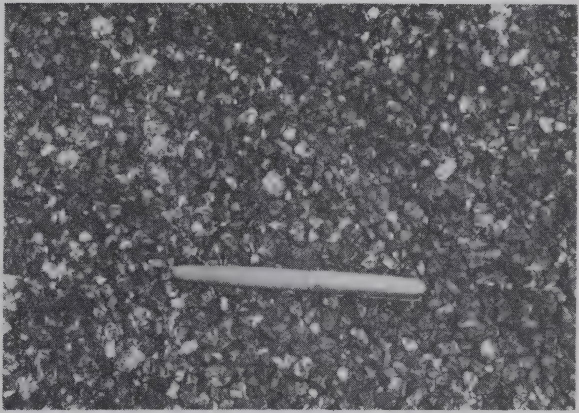


8. Shows the texture of the lean rock asphalt cover material.

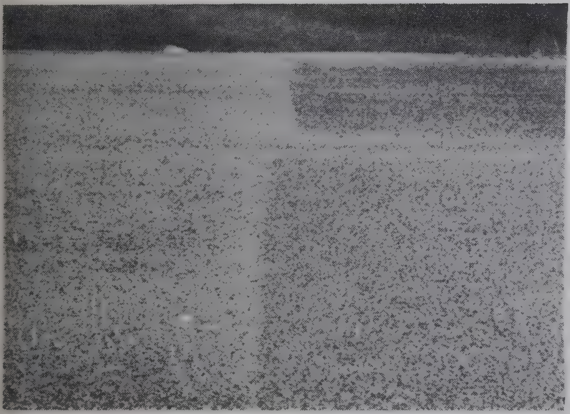
9. Shows the texture of the rock asphalt precoated.



10. Shows the texture of crushed limestone unwashed.



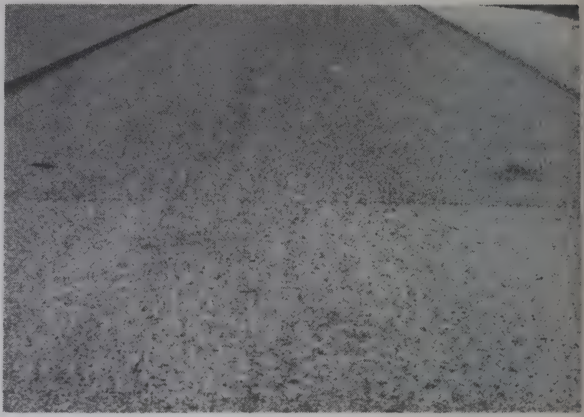
11. Shows the texture of the crushed limestone precoated with OA-230 asphalt.



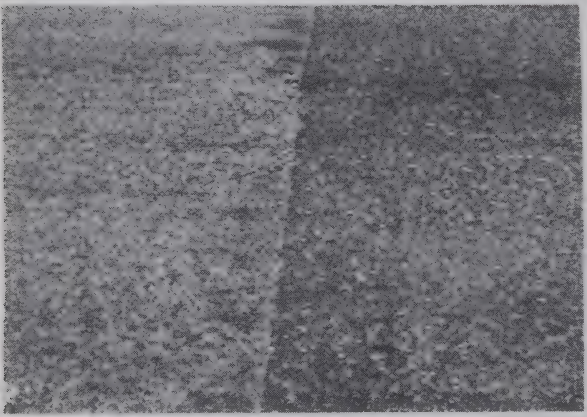
12. Washed limestone on the left, precoated (15% EA1OS solution) on the right.

13. Same as Number 12, one month later, untreated in the foreground, precoated in the background.

14. Crushed, washed limestone gravel on the left, same material precoated with EA1OS solution on the right.



15. Same as Number 14, one month later, untreated in the foreground, treated in the background.



16. Lean rock asphalt uncoated on the left, precoated rock asphalt on the right.

17. Same as Number 16 uncoated in the foreground, precoated in the background.

18. Crushed limestone in the foreground, and limestone precoated with OA-230 asphalt in the background.

tion the hazard to the traveling public of flying stone.

3. Provide adequate engineering inspection of the work in its entirety. In District 14 work performed by State forces is rigidly inspected as work performed by contractors.

Do Not:

1. Do not attempt to add water to the rapid setting high viscosity emulsified asphalt because in most cases the water will break the asphalt and the residue cannot be pumped.

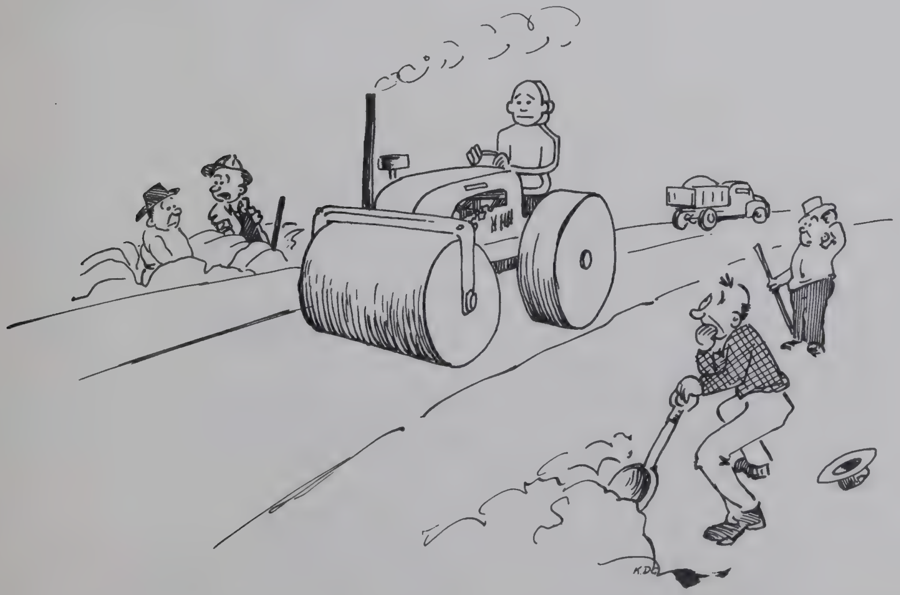
2. Do not shoot emulsified asphalt in doubtful weather, if the surface must be used by traffic, because a rain on the new surface will cause loss of aggregate, tracking, etc..

3. Do not get the idea that these very light inexpensive treatments as described herein will make a complete high type pavement or that they are a cure-all.

4. Do not attempt the use of this type seal coat on a large scale basis until you have tried it and become familiar with it on a small scale.

5. Do not allow the rapid setting high viscosity emulsified asphalt as shown in Table Number 3 to freeze. This District is purchasing for winter storage a high viscosity emulsified asphalt, the specifications for which are shown in Table Number 9.

Conclusion: Just like the day of turning traffic on unmaintained earth roads as detours has passed, it is the opinion of this District, that the day of unprotected areas containing surplus or loose stone will pass. To eliminate loose stone and bleeding as well as to maintain a non-skid surface and to maintain a good light reflecting surface and to hold the cost of this work within our means, the type seal coat mentioned above has the greatest promise of any of the asphalt work that has been performed in this District in the last five years.



"But Hodley crawls right back up there and tries again."

"Comments From the Traveling Public"
OVER THE HIGHWAYS

To The Governor
State of Texas

. . . This is to advise you that my wife and I just recently completed a quite long tour of several states. We were so impressed with the splendid roads we found in your state, and also noted the immense improvements underway, that I am taking this opportunity to thank you and your aides.

Not only were the roads so much better than the average, but the people of Texas as a whole were so nice to us, and again I take my hat off to a very fine state, and look forward to the time when we again can visit the Lone Star State. . . .

Don E. Hoover
155 Stanley Street
Peoria, Illinois

. . . Thank you so much for your very kind letter of September 8 concerning your recent visit to Texas and complimenting the condition of the highways in Texas.

I am taking the liberty of sharing your letter with Mr. D. C. Greer, State Highway Engineer.

I am indeed grateful to know that you enjoyed your stay in Texas and I hope that you and your wife will have the opportunity to return in the very near future.

ALLAN SHIVERS
Governor of Texas

. . . Several weeks ago, a maintenance employee handed me this appeal. I think this is a clever and a worthwhile action on the part of the Highway Department. I like it. Not only did I try to observe the request, but I noticed several other motorists doing likewise. This effort combines efficiency with courtesy and consideration. You are to be complimented for it.

Paul C. Ferguson
Dallas 1, Texas

★ THE APPEAL

Please Drive Carefully

You are entering a section of road under construction.
Watch for uncovered asphalt and flying stone.
Please do not pass the car ahead.
We are performing this work without causing you to travel additional miles on a detour.
The inconvenience is regrettable, but we believe you would prefer this method.
The Highway Department is spending $6,000,000 on this type of repair this year in order to keep our roads of a modern standard.

Thank You,
TEXAS HIGHWAY DEPARTMENT

. . . For the past three weeks, I have spent most of my time traveling over a good portion of the states of Texas, New Mexico and Colorado. I think any person could tell when he left or entered the state of Texas, even if signs indicating that fact were not in existence. Without any question, persons will appreciate the excellent roadways of our state.

My congratulations to you and to your associates who are responsible for the excellent condition of the highways throughout the state of Texas.

Roderic B. Thomas
Dallas Rupe & Son
Dallas 1, Texas

. . . Truck Number ______ was observed unloading a truck load of gravel in a private driveway on Friday, September 29th. Is this State Highway business?

[redacted], Texas

. . . Just a note to tell you how much we enjoyed the roadside parks between Waco and Galveston last week.

Being able to stop at a nice roadside park at several points enroute relieved the monotony of the long drive and was a pleasure enjoyed by the whole family. We are proud of the Texas Highway Department and hope you see fit to continue the upkeep of the roadside parks.

M. L. Saunders
The Perfection Company
Waco, Texas

. . . This is to report a flagrant safety violation by one of your drivers. This driver whipped in front of a car in the left lane, around one in the right and then passed on right side of the next---speeding 48 miles per hour in a 35 MPH zone. The vehicle was a yellow pick-up, Dodge ('39 or '40 model) with State Highway Department Insignia number ______. To make it ironic--there was a spot announcement by the State Highway Department cautioning the public to be careful while driving. . . .

A. N. Mangham
[redacted]
[redacted], Texas

. . . Many thanks for sending the anti-gravel letter. It does my old heart good. I wrote a little piece about it for the paper today. . . .

Dick Morehead
Dallas Morning News

Comments from Tourists

. . . We enjoyed Texas very much and plan on vacationing there again. The next time, because of the excellent roadside parks, we plan on doing some picnicking and thus cutting our expenses.

Wichita, Kansas

. . . The service rendered by your Information Bureau was most helpful. Your state should be commended for making such an attempt to serve guests to your state in this manner. . . .

Canton, Mississippi

. . . Now I can believe most of those Texas "lies."

Jacksonville, Florida

. . . The only state in our 8000 mile trip that welcomed us into their borders. My son and I have visited thirty-five of the United States and this is the very first time we have ever had someone meet us at the border and tell us we were welcome.

Public rest rooms at parks would be helpful.

Frank F. Swick
New Brighton, Pennsylvania

. . . We found that the Texas roads are far superior to the roads of the neighboring states.

Chicago, Illinois

. . . Roads good, route markers excellent, large signs with arrows at intersections a big aid especially at night.

Milford Koch
3116 Kemp Drive
St. Louis, Missouri

. . . I like your state very much but if you want us to spend our money in Texas. . . treat us as people. We do not like to be slapped in the face with "damned Yankees." The Civil War was over one hundred years ago.

Robert Shaw
Ludington, Michigan

. . . Information Bureau services excellent--exemplary personnel for other states. Roads excellent. My wife hated the idea of coming through Texas and has had nothing but glowing reports since.

Seattle, Washington

. . . We were very impressed by the Information Bureau, and think it is a very nice service and only state I have ever seen them in. Your roadside parks looked very good but are second only to the ones in Ohio.

P. F. Collins
Warren, Pennsylvania

. . . Highways into Ft. Worth and Dallas were found very good. The loop around these two cities is one of the finest ideas in the country.

Los Angeles, California

Suggestions from Tourists for Field

. . . As result of gravel have several holes in windshield. Service man at station reports most cars coming through have same.

Tracy Clark
Piedmont, California

. . . Your roadside parks are too far apart . . .

Rudolph Veselok
Cedar Lane
Hartsville, South Carolina

. . . the roadside parks were very nice. However, running water would be very helpful. . . .

Fairfield, California

. . . Highway Department should eliminate dips . . .

Berwyn, Illinois

. . . We think Louisiana should have some roadside parks.

Opelousas, Louisiana

. . . We would have made more use of roadside parks had we known when to expect them. I suggest marking positions on your road maps. In most respects, our own country can equal or surpass Texas, but your highways are superior.

Z. Duncam
Johannesburg, South Africa

. . . Would like to see a white instead of a black line down the center of your highways.

O. R. Howell
Santa Monica, California

. . . Arrows on highway markers not large enough to read from distance. Should be separate or sign enlarged to permit greater size of arrow head.

Kalamazoo, Michigan

. . . Your roads are very good only not enough markers or showing the places of interest.

William Schwartz
RFD #2
Wakeman, Ohio

. . . Suggest sign placement showing high points elevation. . . .

L. W. Abbot
5825 Foothill Drive
Hollywood, California

. . . White lines on black highways needed. Impossible to drive at night without them. . . .

Havre, Montana

. . . Road markers good on highways, but seemed inadequate in small towns. . . .

Hyattsville, Maryland

. . . You have terrific roads. but terrible road signs.

Brooklyn 30, New York

. . . Why use gravel to stabilize roads? Your signs asking drivers to slow down seem to be go ahead signals to most Texans.

China Lake, California

. . . The traffic around school zones is very hazardous. Marking is very obsolete, road markings are hidden by large growth of grass and weeds.

Los Angeles, California

. . . The highway signs very complicated around Dallas. Too many signs on corners leading to the same outlet. When one is used to following one straight turn or street on highway, they don't know which one to take until you are around town for some time.

Lincoln, Nebraska

. . . Highway signs misleading . . . Highways in desert wonderful.

F. E. Lehmann
Ingallston, Michigan

Judging from the comments from tourist
our signs could stand a little checking
J.A.W.